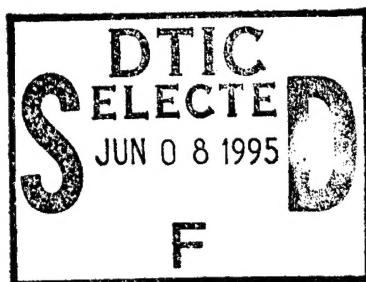


NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

THE IMPACT OF THE FORCE DRAWDOWN ON THE PROMOTION OF
MINORITY OFFICERS IN THE US MILITARY

by

Cameron D. Darrow

March, 1995

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by

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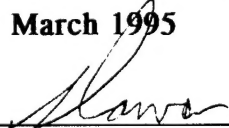
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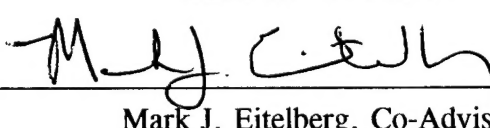
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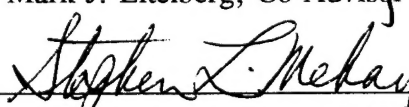
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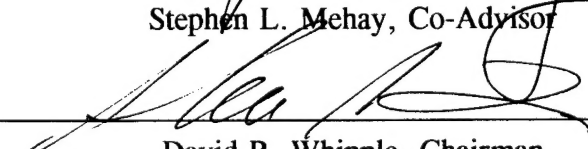
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ABSTRACT

Department of Defense (DoD) policies have historically supported specific objectives with regard to minorities in all phases of the manpower system, including accession, retention, and promotion. Drawdown policies, however, have been designed primarily to meet endstrength goals, without regard to any potential effects on specific groups. The purpose of this research is to analyze the effects of the drawdown on the promotion of minority officers. The research utilizes data covering all services provided by the Defense Manpower Data Center. Ordinary least squares and logit modeling techniques are employed to estimate the promotion performance of officers prior to, and during, the drawdown. The results show that, across DoD, minority status is no longer a factor in promotion outcomes; and the promotion of minority officers, in general, has not been adversely affected during the drawdown. However, there has been a significant decline in the probability of promotion for blacks and Hispanics in the Navy. Further research is recommended to refine the promotion models and monitor minority group promotion opportunities as the drawdown continues.

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I. INTRODUCTION

A. BACKGROUND

In recent years, some concern has been expressed by Department of Defense officials about the rate at which minority active duty officers are promoted as compared with their non-minority counterparts (Robinson and Prevette, 1992). This concern has extended to the current military downsizing, during which numerous policies have been implemented to assist policymakers in achieving endstrength goals and in restructuring the force.

DOD policies have historically supported specific objectives with regard to minorities in all phases of the manpower system, including accession, retention, and promotion. Drawdown policies, however, have been designed primarily to meet endstrength goals, without regard to any potential effects on specific groups. Similarly, the military downsizing has eliminated many billets and facilities, which may have affected the opportunities for some officer groups more or less than others.

Hence, it is appropriate to determine what unintended effects the drawdown, and the policies that have been implemented to achieve the drawdown, may have had on the position of minority officers. After all, "civil rights leaders worry that minorities will suffer disproportionately from the Defense Department's ongoing manpower squeeze" (Kitfield, 1994, p.28). Even at the dawn of the All-Volunteer Force (AVF), there were critics who feared that the military would become increasingly unrepresentative of the society it was established to protect and defend (Binkin and Eitelberg, 1986, p.74).

B. OBJECTIVES OF STUDY

The study attempts to identify potential problem areas in which downsizing policies may have affected the status of minority officers. It also attempts to identify potential

solutions to such problems. The benefit to DOD is that the solution of such problems may improve the overall utilization of the officer corps, and, ultimately, military readiness.

C. RESEARCH QUESTIONS

The purpose of this research is to analyze the effects of the drawdown on the promotion of minority officers. The research seeks to determine whether differences exist in the promotion experiences of minority and non-minority officers; if such differences exist, which specific policies or determinants can be identified as causal influences; and, if differences exist, whether they have improved or deteriorated during the period of the military drawdown.

D. SCOPE, LIMITATIONS AND ASSUMPTIONS

The literature concerning the employment of racial and ethnic minorities, the drawdown and promotion rates, and determinants of promotion is examined. This places the ensuing analysis in context and assists in specifying the multivariate promotion models. The scope of the thesis is also determined, in part, by the data set. Promotion rate data are available from 1977 through to 1994.

Although women are commonly referred to as a "minority" in the military (despite the fact that they are a majority of the general population), they are not considered as part of the minority group in this study, though they are recognised separately. This is because the experiences of, and problems facing, women are not the same as those of ethnic or racial minorities. Therefore, any further reference to a "minority" is made with respect to racial/ethnic minority groups (male or female). Furthermore, only three racial/ethnic minority groups are considered: blacks, Hispanics, and others. This third group, called "others", simplifies the analysis by amalgamating a diverse range of racial/ethnic groups that constitute a relatively small proportion of the population.

It is also assumed that the reader is already familiar with the history of minority involvement in the US military (specifically, prior to the creation of the AVF). Consequently, a detailed commentary is not undertaken in this study. Nixon (1993), Northrup et al. (1979), and Binkin and Eitelberg (1982) give thorough analyses of this historical involvement.

E. LITERATURE OVERVIEW

The literature review focuses on journal articles, technical reports, and books on the drawdown, promotion, and minority issues. It describes how organizations have sought to manage reductions-in-force while trying to promote diversity throughout the workplace. More specifically, the review emphasizes material concerning the determinants of minority promotion, as a basis for an *a priori* evaluation of the effect of the drawdown on the promotion of minority officers.

F. ORGANIZATION

This study is organized into seven chapters. Following these introductory remarks is a chapter ("Background") that discusses minority representation, the evolution of attitudes towards minorities in the US, the military's approach to combating racial and representation problems, and the experience of previous military drawdowns. Chapter III ("Literature Review"), surveys a range of articles and reports that are relevant to this study. Chapter IV ("Ethnic Representation and Occupational Trends") provides an analysis of the data files and some descriptive statistics concerning ethnic representation in the military. Chapter V ("Methodology in Promotion Analysis"), describes the restrictions and assumptions that have been placed upon the cohort data file in this study, the effects of these processes on the suitability of the data file for this study, and the variables that are used in the promotion models. Chapter V also discusses the data analysis and statistical procedures that are employed. Chapter VI ("Analysis of Promotion Outcomes"),

reports the findings and interprets the results of the analysis.
Chapter VII contains the conclusions and recommendations.

II. BACKGROUND

A. WHY IS MINORITY REPRESENTATION AN ISSUE?

1. Evidence of Discrimination

"Ethnic minorities and women in the United States have suffered social and economic discrimination for centuries," observe Kravitz and Platania (1993, p.928). This has resulted in a tremendous disparity between the proportion of minorities in the general population and the proportion of highly-paid professional employees who are members of minority groups. According to the Statistical Abstract of the United States (U.S. Bureau of the Census, 1993, p.22), the major racial or ethnic groups and their respective percentage of the population in 1991 were: white (75.2 percent), black (11.9 percent), Hispanic (9.3 percent) and other (3.7 percent). Yet, as Zweigenhaft reported in 1987, just 32 of the top 100 major corporations in the US had at least one black on their board; and none of these had become a chief executive officer (Zweigenhaft, 1987, p.38).

2. Discrimination Remedies

Attempts have been made in recent years to decrease discrimination based on demographic status and to mitigate the effects of past discrimination. A range of Equal Employment Opportunity (EEO) and Affirmative Action (AA) programs have been conceived to this end. Representation goals have, therefore, been justified to eventually restore equity to the labor market and, in the more immediate timeframe, to provide a reference point for measuring the success of EEO and AA initiatives. The importance of representation has intensified over the years as the "shift toward minorities since 1980 is the sharpest of the 20th century" (Barringer, 1991, p.1).

3. Inherent Policy Contradictions

As some writers have observed, the principles of equal opportunity and equal representation are often at odds with each other. For example, Brehm is cited by Binkin and Eitelberg

(1986, p.88) as asking: "Does America prefer its army to represent a reasonable cross section of the American racial and social fabric, or will it be content to accept major departures from a representative force as a consequence of applying the principle of equal opportunity to a PMVF [Peacetime Military Volunteer Force] recruited largely through economic incentives?" In other words, there can be an inherent contradiction between letting the market forces govern recruiting outcomes and, similarly, identifying specific representation targets for those outcomes. This is one of the key dilemmas of the volunteer force.

B. IS POPULATION REPRESENTATION AN APPROPRIATE GOAL?

1. Determining the Population Against Which Representation Should be Assessed

The US Navy has established the goal of achieving population representation for minorities within its officer ranks by the year 2001. However, Sowell points out that there are differences in the average ages of ethnic groups and that to "compare any group's representation in adult jobs with their representation in a population that includes five-year-olds is to compare apples and oranges" (Sowell, 1982, pp.37-38). The debates concerning representation often proceed without considering whether or not the pool of people from which the military can draw actually represents the general population (Gorman and Thomas, 1993, p.611). Therefore, *demographic* representation is more relevant.

It is generally a prerequisite for an officer to be a college graduate. Similarly, most officers do not serve much beyond 20 years. Therefore, it can be assumed that most officers fall within the range of 22 to 42 years old. The closest age range that can be used from available census data is for 20 to 44 year olds. A comparison of the ethnic representation of the total population and this specified range for 1991 is shown in Table 1.

Table 1. Representation by Racial/Ethnic Group and Age Group,
1991

Racial/Ethnic Group	Percentage Representation	
	20 - 44 Year Olds	Total Population
White	73.1	75.2
Black	12.3	11.9
Hispanic	10.5	9.3
Other	4.1	3.7

Source: U.S. Bureau of the Census, 1993, p.22.

As seen in Table 1, Sowell's concerns are generally unfounded with respect to the military. This is because all of the ethnic minority groups have a higher concentration of their numbers in the age bracket that is most closely associated with military service. It could be argued that the goal of population representation in the military does not go far enough. However, it represents a worthwhile goal which, if fulfilled, would go a long way toward redressing the current ethnic or racial imbalances in representation.

2. Is There a Trade-off Between "Representation" and "Readiness"?

The primary function of any military establishment is to defend the nation and its interests. Moskos argues that "the ideas of citizenship obligation or social representativeness are incidental concerns in manning a military force. Such a mindset has contributed to moving the American military toward an occupational format" (Moskos, 1986, pp.15-16). After all, the establishment of the new representation goals invokes an intuitively strong theoretical relationship. If accession standards have to be lowered, pursuing these goals may be met at

the expense of military effectiveness; conversely, effectiveness may be maintained at the expense of equity and representation considerations. Therefore, the question of "whether the racial makeup of the armed forces has any bearing on their capacity to fulfill that mission must be examined" (Binkin and Eitelberg, 1982, p.84).

There has been much discussion in recent years concerning the link between "quality" and the performance of military personnel. However, the extent of any trade-off between minority representation and readiness has seldomly been addressed. Binkin and Eitelberg assessed the effectiveness of military forces in terms of three factors: the capabilities of the individuals, group performance, and the image they project to other countries. They concluded that a "healthy measure of uncertainty remains about how the racial composition of the armed services affects all three" (Binkin and Eitelberg, 1982, p.119).

Some studies have attempted to link mental ability and on-the-job performance.¹ The vast majority of studies, however, focus on the enlisted ranks and not on officers. Although a clear link has been established between Armed Forces Qualification Test (AFQT) categories, high school diploma status, and attrition, the link between these factors and actual job performance is much more dubious. In psychology, the "goodness" of a predictor of job performance is assessed against two criteria: reliability and validity. Reliability refers to "consistency and stability of measure; validity refers to accuracy and precision" (Muchinsky, 1993, p.93). If either of these criteria are not satisfied, then the relationship between the predictor and job performance becomes less clear.

In fact, most researchers believe that AFQT and high school diploma status are indicators not of "quality", but of

¹ For example, see "Are smart tankers better? AFQT and military productivity" by Scribner et al. (1986), in which a positive relationship between the two is identified.

persistence, or the ability to see an activity through to its completion. Although it is pleasing to one's intuition, there is simply very little empirical evidence that a person with a higher score on a college admissions test (such as the Scholastic Aptitude Test or SAT) will make a better officer. There are many things that contribute to an officer's success that may not be measured by such tests, with leadership and communication skills as good examples. Many even charge that such standardized tests are biased against minorities. Because of the consistent differences in average group performance on many standardized tests, there has been a persistent concern that ability tests may be biased against minority group members (Hartigan and Wigdor, 1989, pp.5-6). The fact that a test is a "paper and pencil" instrument, or uses the English language, can in itself be a source of bias against minority applicants within a multi-cultural society (Crocker and Algina, 1986, p.376-393). Therefore, it cannot be concluded definitively that there is any significant trade-off between representation and military readiness.

3. Anti-discrimination Programs

A number of anti-discrimination programs have been introduced into the labor market in recent years. Most of these can be categorized as either EEO or AA programs. Although these terms are often used synonymously or in conjunction with each other, they are fundamentally different in their methods and aims. Under an EEO program, a person is judged as an individual according to his or her merits; whereas, under an AA program, a person is also judged as a member of a group and may receive differential treatment according to the status of that group.

Kravitz and Platania (1993) argue that although whites "support equal opportunity, they generally oppose affirmative action. Specifically, they oppose quota hiring and preferential treatment for under-represented groups" (Kravitz and Platania, 1993, p.928). Affirmative action measures are often used to temporarily accelerate the accession and promotion of minorities

(at above average rates) so that the minority representation is equal to or greater than the average. However, this will ensure that the majority is recruited and promoted at below-average rates over that transitional period (Robinson and Prevette, 1992, p.17). After all, nothing abuses a person's sense of natural justice more than the unequal treatment of equals (Block and Walker, 1982, p.5). Denying people the opportunity to join the military simply because quotas have to be met forces them to adopt a different or less desirable employment option. It can be argued that these "people designated 'overrepresented' end up paying the full cost of achieving someone else's version of social justice" (Gorman and Thomas, 1993, p.612).

The important point is to not lose sight of the theory behind the principle of AA. Given two equally qualified people, AA measures seek to give preference to the minority applicant. The "action" is expected to affirmatively counteract the effects of institutional discrimination, which, by definition, cannot be easily eliminated. AA is frequently misunderstood and poorly implemented--mostly because two human beings are never equal.

By these standards, therefore, any mechanisms that the military uses to raise ethnic representation are likely to be perceived as affirmative action measures, as they seek to attract and retain personnel from particular ethnic groups. In fact, Sniderman and Tetlock (1986) support research that systematically attempts to assess the impact of racist motives on support for government programs to assist minorities. They "strongly object, however, to treating opposition to such policies as racist by definition" (Sniderman and Tetlock, 1986, p.182). It is necessary to try and put racial views aside and deal with the policy issues in as objective a manner as possible.

C. MINORITIES IN THE MILITARY

1. The Effect of the AVF on Minorities

The AVF era has actually seen blacks become overrepresented in the military's enlisted force. Smaller

increases have been associated with minority representation in the officer ranks. Consequently, the effect of military service on minority groups has become a significant issue. A primary concern is that military service risks the lives of many of the most talented and promising future minority leaders. However, there is widespread recognition of the benefits that military service can bestow upon its members--aside from the obvious benefits of employment and income.

First, the military serves as a valuable training ground, giving minorities opportunities for education and skills training that they might otherwise not receive. In fact, Janowitz and Moskos (1994) argue from the perspective of civil-military relations that there should be clearer recognition of the secondary functions of the military with respect to education and skills training as there remains a great deal of uncertainty and ambiguity about this task among professional officers (Janowitz and Moskos, 1974, p.119).

Second, Young (1982) relates how minority-military service, particularly during times of war, can adopt a "quid pro quo" theme, namely, "full support of the war effort on the part of the minority and its leadership in return for full citizenship rights or other benefits for minority-group members" (Young, 1982, p.255). Even in peacetime, military service can help assimilate minorities into society. Young cites Shils as saying that the military "can serve to integrate diverse ethnic groups into a national community; it can teach skills useful in economic development...and give them a greater concern for the nation as a whole" (Young, 1982, p.25).

2. Military Manpower Considerations

A number of factors associated with minority participation in the military need to be considered when policy makers seek to increase this participation. For example, many of the minorities of Hispanic and Asian origin are first- or second-generation immigrants from countries in which the military may not be viewed as a desirable career option. In some cases (such

as Cuba and Chile), these immigrants have fled from oppressive military rule. It could therefore be much harder to meet the representation goals for these ethnic groups.

Another factor that could make this goal difficult to achieve is the ability of minority candidates to meet the military's quality requirements. For example, Binkin and Eitelberg (1986) report that the military is becoming increasingly technological and therefore requires rising levels of education and ability from its new personnel. However, the "margin of difference in the average educational level of whites and blacks nationwide and the test score differences revealed in the *Profile of American Youth* imply that, unless the services modify their classification criteria, blacks (as well as Hispanics) may be disproportionately relegated to the military's 'soft skills' for some time to come" (Binkin and Eitelberg, 1986, p.96). Since these so-called "soft" jobs are diminishing, minorities may actually wind up being squeezed out of the military, unless compensatory measures are introduced. Changes in eligibility requirements may therefore have to be considered if minority representation is going to be increased. At the same time, attempts to achieve increased participation by minorities are affected by trends in the population of military-age youth, including both the declining supply of potential members and shifts in the relative size of racial/ethnic groups. These trends are illustrated in Table 2.

The age bracket of 15- to 24-year-olds covers the main recruiting population for military officers, as it encompasses recent college graduates, current college students, and short-term college entrants. Table 2 confirms that, even in absolute terms, this youth population actually decreased by almost 5.5 million between 1980 and 1990. At a macro level, this is not a good trend for future recruiting--though the impact may be partly offset by the reduced requirement for manpower in the "downsized" force.

Table 2. Number and Percentage Distribution of Youth Population,
15-24 Years Old, by Ethnic Group, 1980, 1990

Racial/Ethnic Group	1980		1990	
	(000)	Percent	(000)	Percent
White	32,740	77.0	25,969	70.1
Black	5,633	13.3	5,133	13.9
Hispanic	3,192	7.5	4,404	11.9
Other	922	2.2	1,508	4.1
Total	42,487	100.0	37,014	100.0

Source: U.S. Bureau of the Census, 1993, p.22

Furthermore, this population trend has more or less bottomed out in 1995. Table 3 shows projected population distribution trends to the year 2010. It can be seen that the proportion of youths in the population is projected to be stable for the remainder of the decade and slowly rise thereafter. Table 3 also shows that all of the minority groups should continue to increase their share of the youth population at the expense of whites. Future diversity targets may actually become easier to satisfy.

It is widely acknowledged that because of the intense competition women face for limited employment opportunities in the military, the women who succeed in gaining military commissions have higher average levels of education and SAT scores than do men. To some degree, therefore, targeting minority women may overcome some of the problems of selecting qualified people and, similarly, further help the military meet its diversity goals (on both ethnic and gender grounds).

Table 3. Projected Percentage Distribution of Youth Population,
18-24 Years Old, 1995, 2000, 2005, 2010

Racial/Ethnic Group	1995	2000	2005	2010
White	67.9	66.5	65.2	62.9
Black	14.2	14.3	14.1	14.7
Hispanic	12.9	13.6	14.4	15.6
Other	5.0	5.6	6.3	6.8
18-24 Year Olds as Percent of Population	9.5	9.5	9.8	10.1

Source: U.S. Bureau of the Census, 1993, p.25.

III. LITERATURE REVIEW

A. WHAT ARE THE RECURRENT ISSUES DISCUSSED IN THE LITERATURE?

Because this is such a current topic, the literature does not specifically address the issue of minority promotions during a military drawdown. However, the participation of minorities in the military has been studied in some detail. According to Young (1982), "the subject of minority groups and military service should be dealt with not only in terms of a study of such groups in military organizations; rather, it should also be examined in terms of the societal context within which the interaction between the group and the military organization operates" (Young, 1982, p.20). Consequently, some major issues associated with this subject are identified and examined below.

B. IMPORTANCE OF PROMOTION

Promotions are extremely important to employees and organizations. However, the extensive downsizing that has been associated with the corporate environment in recent years has reduced the opportunity for upward mobility. This has presented a management crisis, about which very little research has been undertaken. It is therefore appropriate to examine the importance and determinants of the promotion decision in some detail.

1. Promotions as a Motivation and Allocation Tool

Organizations use promotions to motivate employees (Markham, Harlan and Hackett, 1987; Rosenbaum, 1984). Promotions are a source of status, recognition, responsibility, higher pay, and opportunities for further advancement. In fact, for virtually "as long as work organizations have been in existence, employees have defined their career success in terms of upward mobility" (Ferris et al., 1994, p.47). A study that examined the relationship between promotion and morale/motivation among Air Force officers reinforced this view. It found that non-selection

for promotion has a negative morale/motivational impact (Winters, 1978).

From the organization's viewpoint, "promotions are central to the efficient utilization of its human resources" (London and Stumpf, 1983, p.242). In other words, promotions improve productivity by channeling employees into positions that best match their abilities and exert pressure on poor performers to either improve their performance or leave the organization (Baker et al., 1988, pp.61-62). This practice is evident in the military, where an "up or out" promotion policy is employed. Accordingly, a youthful force with well-rounded experience can be maintained.

2. Implications of Reduced Promotions

As mentioned earlier, the reality is that promotions are becoming scarce. "Flattening organizational hierarchies, recession, and slow economic recovery have resulted in fewer promotional opportunities for upwardly mobile employees" (Bonner and Medsker, 1993, p.9). This has been exacerbated by baby-boom demographics. According to Baker et al. (1988, p.62), reduced promotion opportunities can be linked to low levels of satisfaction, motivation and commitment, and increases in turnover, apathy, resistance to change, and cynicism. Promotions appear to occupy a central role in the turnover process (Carson et al., 1994, p.456). Managers, therefore, "are struggling to learn new ways to motivate and retain valued employees as promotions become less available" (Gelatt, 1992, p.33).

This situation is complicated somewhat in organizations with an "up or out" promotion system, where non-promotees cannot be retained because failure to promote negates any other indicators of high performance (Bonner and Medsker, 1993, p.9). This is the case in the military, where the "up or out" policy was introduced in 1947 as part of the Officer Personnel Act. It was justified on the grounds of providing a flow of officers through the rank structure to maintain an effective balance of youth, quality, and experience for peacetime that is capable of

meeting the demands of war (Jantz, 1986, p.2). Jantz cites an opposing view to this policy from the 1976 Defense Manpower Commission Report, which argued that it is "inconceivable that a Service member who has been screened many times during his life by other promotion boards, by Service schools and other selection boards, and by other evaluations is suddenly of no further value to his Service simply because the Service does not have enough promotions to go around" (Jantz, 1986, p.2).

This sort of promotion policy adds to the loss of confidence that the non-promotee feels. Similarly, an "up or out" system and/or reduced promotions add to the importance of the promotion decisions and the scrutiny they receive in organizations. This is evident from the fact that, in 1990, nearly 61 percent of the bias charges filed with the Equal Employment Opportunity Commission focused on employee promotion and discharge decisions (Ferris et al., 1992, p.66). These decisions, therefore, need to be taken very seriously.

3. Implications of Poor Promotion Decisions

It follows, then, that in "addition to the legal scrutiny that promotion decisions are likely to receive, organizations should be quite concerned about the skill and performance consequences of faulty upward mobility decisions (Ferris et al., 1992, p.66). It is the organisation that ultimately bears the serious effects of faulty promotion decisions through increased costs due to absenteeism, more grievances filed, and lower productivity (Freiberg, 1991, p.23). This is confirmed by a recent study into the effect of promotion decisions on employee's attitudes. It was found that failure to get an expected promotion "was associated with feelings of inequity, a decrease in commitment and an increase in absenteeism" (Schwarzwald et al., 1992, p.511).

4. Factors that can Affect Promotability

a. System of Promotion

Halaby (1978) cites Weber (an early prominent theorist on promotion systems) as saying that there is "a system

of promotion according to seniority, or to achievement or both" (Halaby, 1978, p.466). The less that promotions are oriented towards seniority, then the more judgmental they can become, "often based on ambiguous criteria and numerous sources of information, much of which is subjective" (Stumpf and London, 1981, p.539). Conversely, in seniority promotion systems, personnel are normally advanced to more senior positions because of their greater length of service--not because of superior skill, ability, or performance (Mills, 1985, p.421). Although military promotions require that the individual reach a certain level of seniority before being considered for promotion, the actual promotion decision is based on a range of individual characteristics. These are examined in the remainder of this section.

b. Individual Variables

Some individual characteristics used to make promotion decisions "are ability related (e.g., performance and potential for advancement), whereas others are nonability related (e.g., sex and race)" (London and Stumpf, 1983, p.243). Wise (1975) found in a promotion study that job performance and promotion, as measured by the rate of salary increase, were not only correlated with academic achievement "but the evidence suggested that mastery of academic subject matter contributed to an individual's ability to perform job-related tasks" (Wise, 1975, p.913). This suggests that academic training and job performance are inter-related and are, therefore, factors that can affect promotability.

Another factor is age. In fact, the importance of age on "promotability" has grown due to the recent elimination of compulsory retirement ages for most workers (Cox and Nkome, 1992, p.197). It is quite reasonable to assume that performance in a job requiring physical responses such as dexterity, strength, speed, and movement accuracy could be age-influenced. However, unequal rewards (be they pay and/or promotions) for older and

younger workers who are either measured or perceived to be essentially equal in performance ability would be discrimination.

In a study of the careers of 1,628 managers and their immediate supervisors in three private-sector organizations, Siegel developed three groups of older and younger ages for comparative purposes. This is because definitions of age groups are quite elusive and at best, very flexible (and changes in legislation are constantly creating confusion in age-related definitions). The three older worker age groups (and their younger worker counterparts) were:

Age Groups	
Older Workers	Younger Workers
45 - 63	23 - 44
50 - 63	23 - 49
55 - 63	23 - 54

The study found that there was no significant difference between the evaluations for all groups of older managers compared with corresponding groups of younger managers. On the other hand, "the likelihood of promotion for these same older and younger groups of managers does show significant differences. In all categories, the older managers are less likely to be promoted" (Siegel, 1993, p.43). Another study found that when work performance was equal, older persons were judged to be less fit to continue their employment (Crew, 1984, p.431).

Consequently, age discrimination can be a factor in promotion decisions. This discrimination is likely to be less common in the military. Age restrictions at the point of accession, combined with the "up or out" promotion policy, and the departure of a large proportion of personnel after 20 years of service tend to reduce the age distribution at any given promotion board. It is determined later in this analysis whether this relative age compression serves to exacerbate the importance of small deviations in age on promotion outcomes in the military.

It is interesting to note that two of the promotion characteristics that have been mentioned here (namely, age and education) are also discussed as prominent determinants of promotion in a 1956 article titled "How to identify promotable executives" (Randle, 1956). The author conducted an extensive survey of 1,427 executives and concluded that "It is apparent that both age and education play an important role in determining promotability or affecting promotion potential" (Randle, 1956, p.132). These factors have therefore stood the test of time.

Yet another factor in promotion decisions may be physical attractiveness. In a study designed to test this hypothesis, it was found that physical attractiveness "significantly affected the extent to which personnel professionals would recommend a candidate for promotion. . . . These findings, however, explained a maximum of only 2% of the variance in ratings" (Morrow et al., 1990, p.733).

This effect may be compounded in the military, because of the fact that promotion boards also view the member's photograph in their file while reviewing his or her performance history. Even though "promotion-board members may not voice prejudices, such information allows them to discriminate, consciously or subconsciously, against minorities in arriving at their decisions" (Baldwin and Rothwell, 1993, p.17). This potential for this effect was confirmed by the analysis of the outcomes from a mock promotion board (Madura, 1977). Photographs were rotated between record folders with the rest of the information in the folder remaining constant. The folders containing "positive charisma" photos consistently rated higher than those folders containing "negative charisma" photos for the same performance data. Essentially, the same pictures were being promoted regardless of the record set accompanying the photo. Stewart and Firestone (1992, p.439) contend that promotion to the upper ranks may reflect underlying stereotypes about which individuals make better officers. The military likes its personnel to have a "command presence" and enforces strict

guidelines regarding proper military appearance (such as clothes, hair, and demeanor).

Therefore, demographic variables, such as race and gender, may have an effect on promotion outcomes. Some studies suggest that "slower promotion rates still persist among minorities, although the findings are not consistent. . . .The facts suggest that one use caution in drawing conclusions, but considerable evidence indicates that minority group members get lower rewards than whites with identical promotion qualifications" (Baker et al., 1988, p.66). Similarly, the disparity in status and income between many men and women can be attributed partly to the differences in their initial job placement. Evidence also suggests that women "continue to suffer in the competition for promotions after placement" (Baker et al., 1988, p.66). It is always difficult to determine whether these groups actually face some form of institutionalized discrimination, or if the promotion models are missing some important variables associated with these demographic characteristics (so that this specification bias is incorrectly reflected in the demographic variables). This problem is addressed in the thesis.

c. Organizational Variables

Finally, organizational variables can affect the "promotability" of all employees within an organization. Structural characteristics may limit career progression. For example, passage toward executive positions may be more open to certain specialties or functions than to others (Tremblay and Roger, 1993, p.418). Another factor, which is also the topic of this study, is the rate of growth of the organization. Rosenbaum conducted a study in which he analyzed this relationship between promotion patterns and increases or decreases in organizational growth. It is no surprise that "the aggregate promotion rates for each level tend to correspond to the growth patterns for the company as a whole, albeit not perfectly" (Rosenbaum, 1979, p.36). Although Rosenbaum's study did not examine any cases of

negative growth or "downsizing", it seems logical from his findings to assume that reductions in the absolute number of employees would result.

C. MINORITIES IN THE WORKPLACE

1. Importance Of Minority Employment

As mentioned earlier, the ethnic composition of American contemporary society is changing relatively rapidly. This change is being mirrored in all areas of employment as evidenced by the "emerging cultural pluralism found in the workplace" (Ramsey, 1993, p.9). This is because employment is the predominant need for any adult immigrant. Employment provides a means of survival and can also be an instrument that either helps or hinders integration into society. In this country, work achievement and the freedom to make career choices "have always been very highly valued. . . .Supporting values include the stress on democracy, freedom, equality, individualism, the future, progress, optimism, and the pursuit of happiness" (Almquist, 1979, p.10).

2. Race Effects In Workplace Performance

Historically, the popular explanation of the economic plight of black Americans has been based on a belief that race, per se, is a more important determinant of employment success than class (Zweigenhaft and Domhoff, 1991, p.138). In other words, it is argued that blacks have confronted discrimination primarily on the basis of their color. A black sociologist, William Wilson, contends otherwise. Wilson (1980) asserts that "class has become more important than race in determining black life-chances in the modern industrial period" (Wilson, 1980, p.150). His key argument is that the fate of minority groups is increasingly dependent on their levels of education and their work skills. Class (or socio-economic status) affects the capacity for people to educate themselves. Therefore, many minority groups would appear to be discriminated against in the workplace even if all discriminatory practices related to racial

or ethnic status were eliminated. This is because past discrimination has impaired their investment in human capital.

On the other hand, many authors disagree with Wilson's argument. According to Zweigenhaft and Domhoff (1991, pp.138-9) the "mainstream position has been that race is of far more importance than class in understanding the situation of black Americans. According to this view, blacks have faced deep-seated prejudices and discrimination simply because of their color, not because they were poor and lower class". McConahay contends that many whites still harbor negative feelings towards blacks, but "it is still not fashionable to express these feelings directly" (McConahay, 1982, p.716).

Gillian Stamp (1990) also describes a "Qualification Ceiling" which tends to impact strongly on racial/ethnic minorities. She argues that this is a real phenomenon and that it is necessary "to make a very clear distinction between the intrinsic capability to carry responsibility at different levels of work and the abilities indicated by certificates" (Stamp, 1990, p.13). These findings have important implications on the specification of the promotion models in later chapters. They suggest that a number of factors other than race need to be considered, if a realistic assessment of the effect of race and discrimination are to be estimated.

3. Race Effects In Performance Evaluations

A number of studies have addressed the issue of how race can affect the performance ratings of workers. Performance ratings are the most commonly used criteria in validation studies, yet they are highly vulnerable to rater effects such as leniency errors, halo errors, and central-tendency errors (Muchinsky, 1993, p.227). Ford et al. (1986) found that whites "rated white ratees higher than black ratees, and black raters assigned higher ratings to blacks than to whites" (Ford et al., 1986, p.330). This seems fair, in a sense, because the bias works against all races. However, the minority ratees are actually at a distinct disadvantage because they are far more

likely than whites to have a rater belonging to a different ethnic group. This is confirmed by the results of a study that examined this relationship from the ratees' perspective. The results of the study "support the hypothesis that people are more confident of ratings of people in their racial group than they are of ratings of other racial groups" (Schmitt and Lippin, 1980, p.434).

It is interesting to note, however, that in a US Navy study, Abrahams et al.(1977) found that their major hypothesis that "black and white classifiers would be differentially biased in their treatment of black and white recruits was not supported." Similarly, in a longitudinal study of a large national sample, Shenhav (1992) examined the effects of workers' race on their entrance into managerial positions in public and private sector organizations. Results suggested that "black workers had promotion advantages in both sectors" (Shenhav, 1992, p.889).

4. Impact Of Discrimination

Despite the best of intentions, however, there will always be some instances of discrimination whenever there is significant ethnic diversity in the workforce. Anti-discrimination initiatives have helped corporate America to do a better job of hiring minorities, but these initiatives have only had a small impact on the promotion process. Minorities (in this case, including women), constitute 65 percent of the total work force, yet only occupy about 5 percent of the top jobs (Stephenson and Krebs, 1993, p.66). There is, consequently, a question of inequity here, regardless of whether or not promotion patterns are caused by overt racial discrimination. The reality is that "statistics on the occupational status of racial minority groups suggest that race is a strong predictor of position in the labor market and career patterns" (Thomas and Alderfer, 1989, p.133). Even high educational attainment does not prevent discrimination. Asian-Americans are a case in point. Compared with the total US population, Asian-Americans have a higher

percentage of graduates from high school (75 versus 67 percent) and college (33 versus 16 percent). However, in 1990, the median earnings for Asian male high school graduates were only 79 percent of the earnings for comparably qualified whites. This gap narrowed to 90 percent for college graduates (Kim and Lewis, 1994, p.286). However, some of the disparity for recent immigrants may be due to differentials in educational credentials, job experience, and language proficiency, or other factors associated with the process of cultural assimilation.

Although the barriers to many white, male-dominated professions are being removed, "the political atmosphere of some environments can preclude success for those newcomers" (Fairhurst and Snaveley, 1983, p.292). These minorities are frequently less likely than other employees to develop supportive relationships within an organization or to receive opportunities to enhance work-related skills. These lost opportunities can diminish the effectiveness of the minority employees' job performance, by suppressing their ability, motivation, or both. Minority members may "internalize an organization's negative evaluations of them and engage in 'self-limiting behaviors'--for example, refusing a challenging job assignment or declining an opportunity for additional training--that perpetuate performance differences between minority and nonminority employees" (Greenhaus et al., 1990, p.66).

5. Ethnic Diversity And Productivity

The fact that organizational constraints may have the effect of reducing the performance of minority employees raises the following question: What are the effects of increased minority hiring on an organization's productivity? Silva and Jacobs (1993) conducted a study that addressed this question specifically. The authors found that there was only a small net performance loss resulting from hiring more minorities in proportion to their representation of the total applicants. However, "increasing minority hiring to a level exceeding minority applicant representation led to a much larger

performance loss" (Silva and Jacobs, 1993, p.595). For each minority employee that is hired above their applicant representation, the mean performance of minority hires decreases by a larger amount, which suggests diminishing marginal productivity. Silva and Jacobs suggest that organizations try to increase recruitment to obtain more quality minority applicants so as to "ensure promotability of minority hires at later stages in their careers" (Silva and Jacobs, 1993, p.599).

D. LESSONS LEARNED FROM CORPORATE DOWNSIZING EFFORTS

Downsizing is the "systematic reduction of a workforce by an employer in a variety of ways, usually as a result of such developments as financial losses, cashflow difficulties, and technological changes. Techniques used include hiring freezes, early retirement, transfers, and terminations" (Appelbaum et al., 1987, p.68). However, it is the latter that is typically associated with downsizing. Downsizing has become one of the most prevalent major changes in U.S. organizations (Smeltzer and Zener, 1992, p.446). According to Overman (1991, p.29), the "mergers and acquisitions in the 1980s, followed by recession in the early 1990s, have left the United States a legacy of layoffsManagement has discovered with a vengeance that labor is a variable". Downsizing and restructuring are designed to improve productivity and efficiency, yet they often have the opposite effect. Many companies discover that they are in worse shape and respond by conducting more extensive downsizing and restructuring, "which places them in a vulnerable business situation" (Tjosvold, 1991, p.79).

Consequently, a wealth of literature has evolved concerning the issue of downsizing. It tends to concentrate on a number of major themes. Bunning (1992), Greenberg (1991), and Smith (1994) discuss why downsizing has become so widespread in recent years and, in some cases, question whether it should be necessary at all (Faltermayer, 1992). Most authors give some attention to how a downsizing program should be implemented. However, Abler and

Marshall (1990), Feldman et al.(1993), Firstenberg (1993), and McLaughlin (1988) cover this in great detail--giving comprehensive step-by-step guides on how to manage the downsizing process.

Other studies (notably Dichter and Trank, 1991; Harari, 1992; Moravec et al., 1994; Weinstein and Leibman, 1991) concentrate on identifying the potential pitfalls of downsizing. Dichter and Trank (1991) examine the legal implications of downsizing, while the others relate the need for effective planning to minimize the potential problem areas.

Another body of literature looks specifically at the impact of downsizing on organizational effectiveness and the morale of employees. These authors (Bell, 1992; Byrne, 1994; Myers, 1993; Osborne, 1990; Sullivan and Silverstein, 1993; Yates, 1985; Zemke, 1990) point out that downsizing programs can have unintended consequences on the productivity of the organization--particularly if the remaining employees feel insecure about their own job security.

Finally, there are some authors who do not regard downsizing as the panacea, in all instances, for corporate American in the 1990s. Francis et al.(1992) and Porter and Kehoe (1993/94) describe cases of organizations that successfully reduced jobs and costs without laying off employees in the private and public sector, respectively. Tomasko (1991) takes this even further. He develops a model in which different restructuring strategies are proposed, depending on the extent of the reduction in personnel that is required and the amount of time that is available for implementation.

1. How Minorities have Fared in Civilian Downsizing Efforts

There is not much literature available that focuses on the effect of downsizing programs on minority employees. One study, however, has been identified. The U.S. General Accounting Office (GAO) examined eight 1982 downsizing programs in eight federal agencies. The main purpose of the study was to analyze

the savings and costs of the eight downsizing efforts and provide a methodology for agencies to use to compare the potential fiscal impacts of downsizing and attrition when faced with the need to reduce staff size. However, it also included a detailed analysis of the effects of the downsizing on the employment status of minorities (GAO, 1985).

The GAO found that minorities were overrepresented among the employees affected by the downsizing programs (those who were separated, downgraded, reassigned, and transferred and who resigned and retired) in seven of the eight agencies. Attrition data for the 12 months prior to the downsizing programs were compared with data on separations generated by the downsizing in the six agencies from which data were available. It could then be determined whether attrition would have resulted in the separation of minorities at rates similar to those resulting from the downsizing. In five of the six agencies, the downsizing resulted in a greater loss of minority employees than would have been expected from "normal" attrition (GAO, 1985, pp.47-49).

It is also relevant for this thesis to note that in one agency, which employed fewer minorities than the other agencies, minorities were not adversely affected by the downsizing. The GAO concluded, in part, that "this may be a function of the positions that were selected for abolition. Men and non-minorities were disproportionately represented in these jobs" (GAO, 1985, p.49). This suggests that the type of occupation in the military may have a bearing on how minority officers are affected by the military drawdown. Similarly, the fact that minority employees have lower representation in some of the military services than in others connotes that the services may have varied success in shielding minorities from the effects of the drawdown.

2. Other Impacts of Downsizing on the Recruitment and Promotion of Minorities

When an organization and/or industry is downsizing, the internal labor market changes as a surplus of labor is created. Employers can be a lot more selective about which employees they keep and who they hire in the future. The easiest way to be more selective is to raise eligibility requirements. It is therefore appropriate to consider the impact of eligibility requirements on minorities.

This is the focus of a study by Steinberg et al.(1990) in which they examine managerial promotions in the public sector. They find that the main barrier to the promotion of minorities is eligibility requirements. Furthermore, job titles which qualify incumbents to apply to take examinations for managerial positions are disproportionately held by white employees. Consequently, although minorities represented 20.5 percent of the New York state labor force in 1979, only 6.6 percent of minority employees were in managerial positions (Steinberg et al., 1990, pp.296-298). These trends would only worsen in a downsizing environment, as workers even have to compete to keep their current jobs.

Because blacks and other minorities generally score lower on standardized tests, the use or increase of categorical cut-offs in the military would result in "clearly a racially disparate impact" (Conciatore, 1990, p.26). Cox (1990, p.96) supports this view, contending that while "the economic realities of a cutback in military personnel. . .will no doubt mean stronger academic preparation as a criterion for entrance, hopefully, the Department of Defense will not repeat academia's mistake: relying on an arbitrary, controversial method as the chief means for evaluating competency."

E. THE MILITARY'S CONTRIBUTION TO THE LITERATURE CONCERNING THE PROMOTION OF MINORITIES

There is a substantial body of literature concerning minority employment issues in the military. But it is also important to acknowledge the context of the military drawdown. DoD is in the midst of a major restructuring which will result in a fundamental change in the way it conducts its business. Now that the cold war is over, the task of downsizing DoD "carries with it a significant challenge--making certain, as we bring down the size of our armed forces and their supporting institutions, that we protect this nation's ability to deter aggression and, if required, to fight and prevail in future conflicts" (Atwood, 1992, p.15).

This process is being driven by the desire of both the U.S. Congress and the American public to see "the so-called economic peace dividend kick in after the dismantling of communism in the former Soviet Union and Eastern Europe" (Ettorre, 1992, p.20). Although force reduction actually began in 1990, most of the earlier downsizing was accomplished through attrition and reduced recruiting. However, because the U.S. "has had an all-volunteer force since 1974, managing this drawdown is far more complicated than the demobilizations that followed World War II or Vietnam" (Van Voorst, 1992, p.30). The officers in the military are now more career-oriented than were their predecessors in the aforementioned campaigns. Researchers agree that this change from conscription to a voluntary military system transformed both the cultural definition of military service and the organizational outcomes of that transformation (Stewart and Firestone, 1992, p.436).

1. Minorities in the Military

The military has sought to maintain its image as an employer that promotes equal opportunity for all racial groups. It is ironic that the military--purportedly one of the most conservative institutions in America--has been at the forefront of the movement to establish equal opportunity. In the past,

though, blacks have been "totally excluded from military service, excluded from combat specialties, excluded from being commissioned as officers, been subject to racial quotas, and segregated in black units" (Segal and Nordlie, 1979, p.135). The significant progress that has been achieved since President Truman's 1948 executive order establishing equality of opportunity in the military has been attributed to its rigidly hierarchical and highly regimented organizational structure. This structure ensures strict obedience to command and, therefore, makes it less difficult to order desegregation or equal treatment than in the civilian sector (Butler and Holmes, 1981, p.17).

2. Military Promotion Studies

Consequently, the military has focused a lot of attention on the study of its promotion systems to assess the key determinants of promotion. For example, a study of Marine Corps promotion found that the "factors that significantly impacted performance at all steps through selection to major were commissioning source, GCT score and composite third standing at the basic school. . . .success was independent of race" (Hamm, 1993). Similarly, another study examined the effect of variables independent of performance on promotion in the Marine Corps. It found that the most significant variables were marital status, attendance at an appropriate level professional school, attainment of a graduate degree, and, to a lesser extent, occupation and commissioning source. Race was one of the most notable factors not having a significant effect on promotion (Long, 1992).

A Navy study found that for Surface Warfare Officers (SWOs), having a high undergraduate GPA, a graduate degree, more than three additional qualification designators (AQDs), and having been screened for command each have a significant positive effect on the probability of promotion (Woo, 1993). Minority status was not mentioned. Baldwin and Rothwell (1993) examined Air Force promotion and found that minorities are not promoted at

the same rate as white officers, but that the differences decrease as rank in the Air Force increases. They also concluded that minorities experience lower promotion probabilities in the Air Force because their records are not as promotable. Baldwin and Rothwell could not quantify this effect because they were not holding other personal variables (such as performance and education) constant.

A couple of other military promotion studies deserve particular attention because the specification of their promotion models provide a useful guide for this thesis. The first is Cymrot's 1986 study that examined the relationship between graduate education and the promotion of Naval officers. He proposed that there are "three types of variables that are used to explain promotion: personal characteristics, previous experiences and performance indicators, and Navy structural variables" (Cymrot, 1986). The former group included age, sex, race and graduate education variables. The inclusion of variables other than graduate education was made to adjust for these other factors that might influence promotion. Cymrot found that race did not have a consistent impact on promotion.

The second study was produced by Stewart and Firestone (1992) who, in part, considered the promotion of minority officers across DoD. The specification of their basic model accounted for the service (Army was the reference service group), race (white was the reference racial/ethnic group), and a vector of dummy variables reflecting each of the cohort years. They used this and other models to conclude that "while retention rates for minorities appear high, little change in the demographic composition of higher grades is likely if current recruitment, and promotion practices continue" (Stewart and Firestone, 1992, p.435).

All of the promotion studies discussed above have been drawn upon in the specification of the promotion models in Chapter v. Other relevant studies in the literature include

Bertolino (1990), Brown et al.(1984), Rupinski (1987), Santens and Walker (1983), and Werkhaven (1993).

F. DEFICIENCIES IN THE LITERATURE

The literature does not, as previously mentioned, specifically address the issue of minority officer promotion during a military drawdown. However, this omission is simply a function of time, as there has not been a significant number of minority officers in the U.S. military during any previous military drawdowns. It is unfair to criticize the literature on these grounds. What is important, is the fact that there has been extensive research into a range of issues surrounding minorities, and their promotion, in the workplace. Downsizing strategies have received similar attention.

IV. ETHNIC REPRESENTATION AND OCCUPATIONAL TRENDS

A. DESCRIPTION OF DATA: OFFICER MASTER FILES

The research utilizes data provided by the Defense Manpower Data Center (DMDC), Monterey. The data cover all services for the years 1987 through 1994, inclusive. Cross-sectional (point-in-time) profiles of the officer corps of each service are developed. These profiles are based on DMDC's Officer Master Files and permit an appraisal of the representation of minorities by paygrade, community, service, and other relevant dimensions before the drawdown and during the early and mid-drawdown periods. This provides a useful means of identifying broad trends associated with the employment of minority officers throughout the drawdown. This information also provides direction and focus for the subsequent statistical modeling and analysis.

B. DATA RESTRICTIONS

A number of restrictions are placed on the officer master files (OMF) in order to generate output in accordance with the specifications outlined above. First, only four variables have been retained. These are DPOC (occupation code), SVC (service), RETH (ethnicity), and PG (paygrade). Second, three further restrictions are placed upon the file:

- a. RETH must to have a valid value.
- b. PG must have a valid entry and be greater than 20 (O-1 or greater) because this analysis is only concerned with officer promotion.
- c. SVC must be less than five, which deletes Coast Guard officers from the sample (Coast Guard officers are included in the officer master files only from 1989 onwards).

The effect of these restrictions on the number of officers in the officer master files is displayed in Table 4.

Table 4. Number of Officers in Officer Master Files (OMF),
Before and After Restrictions, 1987-1994

OMF Year	A. Total Number of Officers	B. Restricted Number of Officers	Difference (A minus B)
1987	307,795	286,884	20,911
1988	304,973	284,540	20,433
1989	309,665	282,885	26,780
1990	303,711	276,645	27,066
1991	297,872	270,431	27,441
1992	280,901	254,653	26,247
1993	264,551	238,624	25,927
1994	253,273	227,801	25,472

Source: Derived from data provided by Defense Manpower Data Center (DMDC).

The impact of the restrictions on the size of the sample is minimal--particularly when one considers that approximately 20 percent of the reduction can be attributed to non-DoD Coast Guard officers, whose absence does not harm the sample for this study at all. The restricted sample provides ample observations for the analysis and is still fully representative of the various demographic groups.

C. DEFINITIONS OF DOD OCCUPATION CODES

The DOD occupation codes used in this research are taken from the "Semi-Annual Occupational Profile of Minorities and Women in the Department of Defense," prepared by the Defense Equal Opportunity Management Institute (DEOMI). The occupational variables in the DMDC files are grouped according to the first character in the field to create the occupation codes.

Consequently, nine single digit occupational codes are presented, as defined by DEOMI (1994):

1. **General officers and executives** (includes all officers of general/flag rank and all commanders, directors, and planners not elsewhere classified).
2. **Tactical operations officers** (includes pilots and crews and operations staff officers).
3. **Intelligence officers** (includes strategic, general, and technical intelligence gathering, analysis, interpretation, and summary).
4. **Engineering and maintenance officers** (includes design, development, production, and maintenance engineering officers).
5. **Scientists and professionals** (includes physical, biological, and social scientists, and other professionals such as lawyers and chaplains).
6. **Medical officers** (includes physicians, dentists, nurses, veterinarians, and closely allied professional medical service officers).
7. **Administrators** (includes general and specialized administration and management officers).
8. **Supply, procurement, and allied officers** (includes officers in supply, procurement and production, transportation, food service, and related logistics activities not elsewhere classified).
9. **Non-occupational** (includes patients, students, trainees, and other officers who for various reasons are not occupationally qualified).

Abbreviations of these occupation codes are presented in the tables below.

D. PRELIMINARY DATA ANALYSIS

1. Distribution of Officers Across DoD

Tables 5,6 and 7 show various aspects of the distribution of officers across the services. It is important to

distinguish between the services because they all have different promotion policies and minimum time-in-rank criteria. Panel A of Table 5 shows the numerical distribution of all officers by service and by year. All of the services have experienced absolute reductions in their officer strength. The overall reduction in officer strength amounts to 59,803 or 20.6 percent during the drawdown. However, this burden has not been shared evenly. This disparity is illustrated in the percentages provided in panel B of Table 5. The Air Force and Army have both suffered proportional reductions in their officer strength, while the Navy and Marine Corps have grown in relative terms. This suggests that the effect of the drawdown on officer promotions might vary by service.

The next point of interest is to consider changes in the distribution of officers by racial group throughout the drawdown. This is displayed in Table 6. Again, the reduction in officer strength has not occurred evenly across racial groups. The data show that, throughout the drawdown, the proportion of white officers has fallen, while the proportions of all minority groups have risen. However, it is difficult to determine what role the drawdown, per se, has had on these trends. All that can be assumed with confidence, at this point, is that the drawdown does not appear to have adversely affected the representation of minority officers. Likewise, promotion outcomes cannot be determined from these data--suffice it to say that they are likely to be different across the racial groups.

Table 7 presents the distribution of officers by racial/ethnic group across the services. It can be calculated from Table 7 that the number of minority officers in DoD has only decreased by 195 (or 0.6 percent) during the drawdown (compared with 20.6 percent for all officers). The services with the most minority officers (Army and Air Force) experienced small reductions in their minority officer strength. Conversely, the Navy and Marine Corps increased their share of DoD minority

Table 5. Distribution of Officers by Service,
1987-1994

A. Number

Fiscal Year	Army	Navy	Marine Corps	Air Force	Total
1987	93,098	67,727	18,729	107,330	286,884
1988	92,125	68,740	18,558	105,117	284,540
1989	91,788	68,938	18,465	103,694	282,885
1990	89,602	68,896	18,104	100,043	276,645
1991	88,653	67,406	17,774	96,598	270,431
1992	81,305	65,706	17,270	90,372	254,653
1993	74,929	63,084	16,545	84,066	238,624
1994	72,203	58,661	16,002	80,935	227,801

B. Percentage

Fiscal Year	Army	Navy	Marine Corps	Air Force	Total
1987	32.5	23.6	6.5	37.4	100.0
1988	32.4	24.2	6.5	36.9	100.0
1989	32.4	24.4	6.5	36.7	100.0
1990	32.4	24.9	6.5	36.2	100.0
1991	32.8	24.9	6.6	35.7	100.0
1992	31.9	25.8	6.8	35.5	100.0
1993	31.4	26.4	6.9	35.3	100.0
1994	31.7	25.8	7.0	35.5	100.0

Source: Derived from data provided by DMDC.

Table 6. Distribution of Officers by Racial/Ethnic Group,
1987-1994

A. Number

Fiscal Year	White	Black	Hispanic	Other	Total
1987	256,018	18,611	5,028	7,227	286,884
1988	253,037	18,786	5,203	7,514	284,540
1989	250,391	19,092	5,537	7,865	282,885
1990	243,647	19,107	5,705	8,186	276,645
1991	237,101	19,082	5,810	8,438	270,431
1992	222,303	18,173	5,807	8,370	254,653
1993	207,824	16,715	5,768	8,317	238,624
1994	197,130	16,367	5,862	8,442	227,801

B. Percentage

Fiscal Year	White	Black	Hispanic	Other	Total
1987	89.2	6.5	1.8	2.5	100.0
1988	88.9	6.6	1.8	2.7	100.0
1989	88.5	6.7	2.0	2.8	100.0
1990	88.1	6.9	2.0	3.0	100.0
1991	87.7	7.1	2.1	3.1	100.0
1992	87.3	7.1	2.3	3.3	100.0
1993	87.1	7.0	2.4	3.5	100.0
1994	86.5	7.2	2.6	3.7	100.0

Source: Derived from data provided by DMDC.

Table 7. Distribution of Minority Officers by Service,
1987-1994

A. Number

Fiscal Year	Army	Navy	Marine Corps	Air Force	Total
1987	13,646	5,236	1,454	10,530	30,866
1988	13,899	5,575	1,515	10,514	31,503
1989	14,326	5,850	1,654	10,664	32,494
1990	14,548	6,263	1,649	10,538	32,998
1991	14,826	6,433	1,656	10,415	33,330
1992	14,204	6,624	1,657	9,865	32,350
1993	13,202	6,725	1,629	9,244	30,800
1994	13,207	6,670	1,670	9,124	30,671

B. Percentage

Fiscal Year	Army	Navy	Marine Corps	Air Force	Total
1987	44.2	17.0	4.7	34.1	100.0
1988	44.1	17.7	4.8	33.4	100.0
1989	44.1	18.0	5.1	32.8	100.0
1990	44.1	19.0	5.0	31.9	100.0
1991	44.5	19.3	5.0	31.2	100.0
1992	43.9	20.5	5.1	30.5	100.0
1993	42.9	21.8	5.3	30.0	100.0
1994	43.1	21.7	5.4	29.8	100.0

Note: Minority officers include persons identified as black, Hispanic, or from another "non-white" racial/ethnic group.

Source: Derived from data provided by DMDC.

officers in both relative and absolute terms. This may be partly attributed to the fact that because of their greater numbers, minority officers in the Army and Air Force are actually less of a "minority" group strictly speaking. Consequently, there may have been more pressure on the Navy and Marine Corps to increase their minority representation.

2. Distribution of Minority Officers by Paygrade

Success in the military is generally associated with being promoted into the senior ranks. In fact, much of the justification for affirmative action policies is based on the perceived need to have minorities sharing positions of power. Successful minorities can act as "role models" for younger minority workers and, more importantly, alter the corporate culture and minimize the institutional bias that may surround the organization's hiring and promotion practices. Representation, on its own, is not enough if most of the minority officers are clustered in the junior ranks.

Consequently, an analysis of the representation of minorities at each paygrade throughout the drawdown gives an added insight into the impact of the drawdown on the promotion of minority officers. Table 8 presents this distribution across DoD.

It can be seen in Table 8 that minority officers are generally over-represented in the junior paygrades (O-1 to O-3) and under-represented in the more senior paygrades, when compared with their total representation. However, this imbalance is gradually being redressed. Total minority representation and the representation of minorities at each paygrade have increased throughout the drawdown. It is significant that, by 1994, minority representation at O-4 reached the level of total representation. Furthermore, representation at O-5 almost doubled during this period and is now poised to reach proportional representation in the next four or five years. The biggest constraint to achieving equal minority representation in

Table 8. Minorities as a Percentage of Commissioned Officers,
by Paygrade, 1987-1994

All Services								
Paygrade	1987	1988	1989	1990	1991	1992	1993	1994
O-1	12.4	12.8	14.2	14.9	15.0	14.8	15.5	17.3
O-2	12.8	13.2	13.2	14.0	14.7	15.6	15.5	15.7
O-3	13.0	13.2	13.4	13.6	13.8	13.9	13.8	13.9
O-4	8.4	9.0	9.8	10.5	11.3	12.2	12.8	13.5
O-5	5.5	5.7	5.9	6.5	7.2	8.0	8.8	9.8
O-6	5.2	5.3	5.3	5.3	5.5	5.7	5.9	6.2
O-7 to O-10	4.8	4.8	4.4	4.6	5.2	5.4	5.8	5.8
TOTAL	10.8	11.1	11.5	11.9	12.3	12.7	12.9	13.5

Source: Derived from data provided by DMDC.

the senior ranks is the fact that it takes many years of work experience to reach the grade of O-5 and beyond. Minority officers must work through the pipeline before being eligible for these promotions. However, at the DoD level, it appears that the distribution of minority officers across the paygrades has become more equitable during the drawdown. These trends are now examined by service.

Table 9 presents these data for the Army. The Army has the largest number and percentage of minority officers of all of the services. It is no surprise, therefore, that the Army's trends are similar (if even a little more extensive in terms of representation) than those that apply to DoD. Proportional representation (when the representation within a grade matches the total representation of a minority) in the grade of O-4 was achieved in 1993 and significant inroads into the representation at the O-5 level were made throughout the period.

Table 9. Minorities as a Percentage of Commissioned Officers,
by Paygrade, 1987-1994

Army								
Paygrade	1987	1988	1989	1990	1991	1992	1993	1994
O-1	16.9	17.4	17.9	18.2	18.4	17.9	17.4	19.0
O-2	17.8	17.9	17.8	19.0	19.2	20.7	19.9	21.2
O-3	17.7	18.1	18.9	19.4	19.9	20.0	19.8	19.8
O-4	11.3	12.0	12.7	13.7	15.0	16.7	18.0	19.1
O-5	7.3	7.6	7.7	8.6	9.4	11.1	12.3	13.3
O-6	7.9	7.9	8.1	7.9	8.1	8.5	9.0	9.1
O-7 to O-10	8.1	8.4	7.6	8.1	8.5	9.3	9.1	8.4
TOTAL	14.7	15.1	15.6	16.2	16.7	17.5	17.6	18.3

Source: Derived from data provided by DMDC.

The same cannot be said for the Navy and Marine Corps (Tables 10 and 11, respectively). Proportional representation has only been maintained in the grades of O-1, O-2 and O-3 in both cases--outcomes that had already been achieved prior to the drawdown. Although the Navy and Marine Corps approximately doubled their minority representation at O-5 and O-6, they still face a problem, particularly in the case of the Marine Corps. Minority representation in O-4 was almost stagnant throughout the period and nearly overtaken by representation at the O-5 level. This casts doubt over the services' ability to sustain increases in O-5 and O-6 representation without compromising promotion standards or introducing fixed quotas for minorities.

This failure of the Navy and Marine Corps to make significant inroads into minority representation at the grade of O-4 is a point of concern. If minority officers are failing to

Table 10. Minorities as a Percentage of Commissioned Officers,
by Paygrade, 1987-1994

Navy

Paygrade	1987	1988	1989	1990	1991	1992	1993	1994
O-1	10.6	10.2	12.0	14.3	14.7	14.8	15.9	18.2
O-2	10.2	11.0	10.8	10.6	12.3	14.0	14.7	14.5
O-3	8.5	9.2	9.3	10.0	10.2	10.8	11.7	12.3
O-4	6.2	6.5	6.7	7.0	7.3	7.5	7.8	8.8
O-5	3.8	4.1	4.4	4.9	5.3	6.0	6.6	6.8
O-6	2.3	2.6	2.8	2.9	3.2	3.3	3.4	4.0
O-7 to O-10	4.2	4.0	3.9	3.5	3.6	3.6	3.8	3.9
TOTAL	7.7	8.1	8.5	9.1	9.5	10.1	10.7	11.4

Source: Derived from data provided by DMDC.

Table 11. Minorities as a Percentage of Commissioned Officers,
by Paygrade, 1987-1994

Marine Corps

Paygrade	1987	1988	1989	1990	1991	1992	1993	1994
O-1	12.2	12.9	14.0	13.7	11.9	12.5	14.1	16.3
O-2	9.9	11.2	12.6	12.3	13.3	13.1	12.2	12.1
O-3	6.8	7.2	7.8	8.9	9.1	9.6	10.0	10.8
O-4	6.4	6.4	6.5	6.7	7.3	7.2	7.1	7.6
O-5	3.0	3.2	3.7	5.6	4.4	4.9	5.7	6.4
O-6	1.9	2.4	2.0	2.0	2.0	3.3	3.7	4.5
O-7 to O-10	1.4	0.0	0.0	0.0	1.5	1.5	1.5	0.0
TOTAL	7.8	8.2	9.0	9.1	9.4	9.6	9.8	10.4

Source: Derived from data provided by DMDC.

make O-4, then they are also failing to make a career in the services. Similarly, this promotion point provides a filter that makes it very difficult for the Navy and Marine Corps to satisfy representation goals at higher levels, as evidenced by the decline in flag-level minority officers throughout the drawdown. This is particularly important in light of the Navy Secretary's stated objective of the Navy achieving population representation for minorities within its officer ranks by the year 2001 (Fuentes and Pexton, 1994).

The distribution of minority officers in the Air Force throughout the drawdown is displayed in Table 12. These outcomes are quite favorable. Proportional representation for the grade of O-4 was achieved in 1990, and significant progress has been made toward achieving this balance for O-5. It can be argued that the Air Force's distribution of minority officers by paygrade is more equitable than that of the Army. However, it is

Table 12. Minorities as a Percentage of Commissioned Officers, by Paygrade, 1987-1994

Air Force								
Paygrade	1987	1988	1989	1990	1991	1992	1993	1994
O-1	10.1	11.2	12.0	11.7	11.8	11.8	13.3	14.6
O-2	10.5	10.3	10.4	11.9	11.9	11.4	11.8	12.0
O-3	12.5	12.3	12.1	11.8	11.9	11.8	11.3	11.0
O-4	7.7	8.7	9.9	10.7	11.3	12.4	12.7	13.0
O-5	5.3	5.2	5.5	6.2	6.8	7.3	7.8	9.3
O-6	5.2	5.4	5.3	5.3	5.2	5.2	5.5	5.7
O-7 to O-10	1.8	2.1	1.8	2.1	3.1	3.2	4.4	5.8
TOTAL	9.8	10.0	10.3	10.5	10.8	10.9	11.0	11.3

Source: Derived from data provided by DMDC.

important to note that it is only the Army that is even close to achieving population representation for minorities (defined as approximately 13 percent, the proportion of blacks in the U.S. population) within its officer ranks. As the other services try to raise their overall representation of minorities by commissioning more minorities at the O-1 level, they will continue to face problems in maintaining an equitable distribution across all of their rank levels because of the time-lags involved.

3. Distribution of Minority Officers by Occupation

The occupational groups in DoD vary in size, organizational structure, retention behavior (driven by differences in civilian employability and the arduousness of the military occupations), accession requirements, promotion requirements, and promotion philosophy. For example, the Navy promotes strictly to fill vacancies within occupational areas (communities), whereas the Air Force and Army promote according to merit across occupations. It is therefore logical that promotion rates differ by occupational groups and that success across the groups is governed by different characteristics. Consequently, minority promotions during the drawdown may have been affected by their occupational status. This hypothesis is explored further in the following tables.

Table 13 displays the percentages of officers in each occupation that are minorities for all services. It shows that the occupational representation of minority officers was stable throughout the drawdown. For the purposes of this study, the DoD occupations "general" and "non-occupation" can be ignored; the former because officers of general/flag rank are not relevant to an analysis of promotion to O-4, and the latter because it gives no information about the officers' employment. The four occupations (supply, administration, health, and engineer/maintenance) with the highest levels of participation of minority officers in 1987 still had the highest participation in 1994. Minority officers were thus overrepresented in these four

occupations. However, minority participation in every occupational group increased between 1987 and 1994. The percentage growth was the greatest in administration (34.0 percent), intelligence (33.7 percent), and engineer/maintenance (31.0 percent). Although minorities are only 10.0 percent of tactical operations officers, other data (Tables 18-22 below) show that, because this is such a large occupational category, it is actually the occupation with the largest number of minority officers. The effect of this occupational mix on minority promotion rates is analysed in the promotion models in Chapter VI.

Table 13. Minorities as a Percentage of Commissioned Officers, by Department of Defense Occupation, 1987-1994

All Services								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	3.7	3.9	3.5	3.6	4.0	4.4	4.9	4.4
Tactical	8.5	8.3	8.6	8.8	9.2	9.4	9.5	10.0
Intelligence	8.9	9.3	10.2	10.9	11.5	12.0	12.1	12.9
Eng & Maint	11.6	13.7	14.1	14.4	14.7	15.2	15.1	15.2
Sci & Prof	8.8	9.0	9.3	9.7	9.9	10.1	10.4	11.2
Health	12.6	12.7	13.1	13.7	14.0	14.4	15.0	15.6
Admin	14.7	17.1	17.4	17.9	18.4	18.9	18.9	19.7
Supply	17.2	16.5	17.1	17.8	18.4	18.7	18.6	19.3
Non-occ	8.4	9.8	10.8	11.7	12.3	12.7	13.7	14.6
TOTAL	10.8	11.1	11.5	11.9	12.3	12.7	12.9	13.5

Source: Derived from data provided by DMDC.

Representation statistics on minority officers by occupation in the Army are presented in Table 14. Although the

participation rates of minorities are higher in the Army than in the other services, the trends and areas of overrepresentation throughout the drawdown are very similar to those shown for DoD in Table 13. The main difference is the much smaller percentage of Army minority officers who are classified as "non-occupation". This may reflect the fact that Army officers generally undergo shorter periods of specialized training than officers from other services; or that, even while Army officers are in training, they are classified in the occupation for which they are being trained.

Table 14. Minorities as a Percentage of Commissioned Officers, by Department of Defense Occupation, 1987-1994

Army								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	8.1	8.3	7.6	8.1	8.5	9.2	9.1	8.4
Tactical	12.3	12.4	12.7	13.2	13.5	13.8	13.8	14.6
Intelligence	9.6	10.4	12.1	13.4	14.3	14.9	14.9	15.5
Eng & Maint	19.1	21.5	21.3	21.8	22.5	24.1	23.1	23.1
Sci & Prof	10.4	10.9	11.1	11.3	11.4	11.6	11.9	12.9
Health	14.2	14.5	15.1	16.0	16.7	17.6	18.5	19.7
Admin	20.3	21.1	21.6	22.4	23.3	24.8	24.8	25.7
Supply	22.7	23.4	23.9	25.0	25.3	25.6	25.1	25.2
Non-occ	2.5	0.0	0.0	0.0	0.0	33.3	0.0	0.0
TOTAL	14.7	15.1	15.6	16.2	16.7	17.5	17.6	18.3

Source: Derived from data provided by DMDC.

Table 15 shows the minority officer occupational participation rates for the Navy. It can be seen that minority officers in the Navy are spread fairly evenly across the seven

major occupations throughout the drawdown. In fact, minority officers are at, or slightly above, proportional representation in five occupations in 1987 and four occupations in 1994 -- with the next two occupations (engineer/maintenance and intelligence) being only marginally below. It is therefore expected that occupational variables will have less influence over promotion outcomes for minorities in the Navy because there is less variation in these variables.

Table 15. Minorities as a Percentage of Commissioned Officers, by Department of Defense Occupation, 1987-1994

DOD Occupation	Navy							
	1987	1988	1989	1990	1991	1992	1993	1994
General	3.4	3.9	3.9	3.5	3.6	3.6	3.8	3.9
Tactical	6.1	5.7	6.0	6.3	6.7	7.2	7.8	8.0
Intelligence	4.9	5.3	5.8	7.1	8.0	8.7	9.4	10.7
Eng & Maint	7.3	7.2	7.7	8.2	8.5	9.1	9.7	10.6
Sci & Prof	8.1	10.7	10.5	10.9	11.9	11.9	12.1	12.6
Health	11.1	11.3	11.1	11.6	11.8	12.1	12.6	13.3
Admin	8.6	12.2	12.7	13.4	14.2	15.2	16.2	17.1
Supply	10.0	9.1	9.9	10.9	11.8	13.0	14.8	16.5
Non-occ	0.0	9.9	11.1	12.6	13.3	13.7	13.8	15.3
TOTAL	7.3	8.1	8.5	9.1	9.5	10.1	10.7	11.4

Source: Derived from data provided by DMDC.

The Marine Corps and Air Force occupational participation rates for minority officers are shown in Tables 16 and 17, respectively. In contrast to the situation in the Navy, minority officers in the Marine Corps are overrepresented in only two occupations during this period--supply and administration.

They have no representation at all in the health occupation in any of the years under review. The Marine Corps does not employ officers in the health area because the Navy provides the Marine Corps with medical support.

Table 16. Minorities as a Percentage of Commissioned Officers, by Department of Defense Occupation, 1987-1994

Marine Corps								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	1.8	2.3	1.7	1.8	2.1	2.7	3.3	4.1
Tactical	5.7	6.2	6.7	7.1	7.2	7.4	7.4	7.9
Intelligence	6.4	5.8	6.1	6.1	6.2	7.3	8.0	9.4
Eng & Maint	9.6	9.6	10.2	10.0	10.3	10.3	9.8	9.9
Sci & Prof	6.1	6.6	7.5	7.9	7.3	9.5	9.4	9.7
Health *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Admin	12.4	12.5	12.8	12.6	14.4	14.7	16.0	16.8
Supply	13.2	13.5	14.5	14.7	15.6	15.7	16.0	16.4
Non-occ	10.9	11.8	14.1	12.3	12.0	12.4	14.3	15.3
TOTAL	7.8	8.2	9.0	9.1	9.3	9.6	9.8	10.4

* The Navy provides the Marine Corps with medical support.

Source: Derived from data provided by DMDC.

In the Air Force, however, the outcome is very similar to the Navy with minority officers maintaining proportional representation across five of the seven occupations throughout most years of the drawdown (see Table 17). The occupational trends in the Air Force have been relatively stable over the period. The representation of minority officers is particularly high in administration and supply. This has been a common finding for DoD and all of the individual military services.

Consequently, the promotion rates of these occupations are analysed further in this study.

Table 17. Minorities as a Percentage of Commissioned Officers, by Department of Defense Occupation, 1987-1994

Air Force								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	4.0	2.1	1.8	2.1	3.1	3.2	4.4	3.2
Tactical	6.2	6.4	6.7	6.9	7.3	7.4	7.4	7.6
Intelligence	10.3	10.2	10.4	10.4	10.3	10.4	10.4	11.1
Eng & Maint	10.8	12.5	12.8	13.0	13.3	13.6	13.5	13.5
Sci & Prof	8.8	7.6	8.1	8.3	8.5	8.7	9.0	9.7
Health	11.3	11.6	12.0	12.6	12.5	12.4	12.7	12.7
Admin	16.2	17.1	17.2	17.2	17.2	17.2	16.8	17.4
Supply	15.2	14.4	14.6	15.0	15.2	15.0	14.6	15.3
Non-occ	6.9	7.9	7.7	8.4	8.8	8.9	12.4	10.3
TOTAL	9.8	10.0	10.3	10.5	10.8	10.9	11.0	11.3

Source: Derived from data provided by DMDC.

The occupational analysis conducted thus far has been concerned only with the proportion of officers in each occupational category that are minorities. These figures can be somewhat misleading because they give no indication of the size of each occupational group. Consequently, if minorities are slightly underrepresented in a large occupational group and overrepresented in a small occupational group, there could be some confusion surrounding the relative importance of these occupations to the minorities. The following tables look only at the minority officers and present their distribution between the occupations to put this size dimension into perspective.

The distribution of minority officers by occupation is provided in Table 18. It gives a different impression of the relative importance of the occupations for the minority officers compared to that in Table 13. For example, in Table 13, minority officers were proportionately underrepresented in tactical operations, comprising approximately nine percent of the officer strength in that occupation. However, Table 18 shows that, throughout the drawdown, approximately 30 percent of minority officers have been employed in tactical operations--making it the singularly most important occupational category for minority officers. Conversely, although minority officers have been over-represented in supply and administration, it can be seen in Table 18 that these occupations only combined to employ about 22 percent of minority officers in 1994. Health is reflected as an

Table 18. Percent Distribution of Minority Commissioned Officers by Department of Defense Occupation, 1987-1994

All Services								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	0.8	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Tactical	30.0	31.8	31.1	30.6	30.6	30.1	29.5	29.0
Intelligence	3.5	3.6	3.9	4.0	4.2	4.3	4.4	4.7
Eng & Maint	16.1	15.0	15.1	14.4	14.2	13.9	13.5	13.7
Sci & Prof	4.5	3.8	3.8	4.0	4.0	3.8	4.0	4.0
Health	16.4	17.1	17.3	18.3	18.5	19.6	20.9	21.4
Admin	16.0	11.5	11.0	10.7	10.6	10.4	9.9	9.8
Supply	11.3	12.4	12.5	12.5	12.7	12.9	12.7	12.5
Non-occ	1.4	4.6	5.1	5.2	5.0	4.8	4.8	4.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Derived from data provided by DMDC.

increasingly important occupation for minority officers during this period.

These findings related to the distribution of minority officers by occupation across DoD almost exactly mirror the conclusions that can be drawn for the Army from Table 19. Although the percentage of minority officers employed in tactical operations declined during the drawdown, it is still the largest employer with 31 percent of minorities assigned there. The proportion of the Army's minority officers employed in health grew markedly to 24.5 percent, while administration and supply remained fairly steady at a combined 22.8 percent. This information facilitates a much more specific and relevant analysis of occupational promotion rates and their effect on

Table 19. Percent Distribution of Minority Commissioned Officers by Department of Defense Occupation, 1987-1994

Army								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.2
Tactical	37.5	37.3	35.6	34.3	33.6	32.5	31.0	31.3
Intelligence	3.7	4.0	4.8	5.1	5.3	5.5	5.7	5.9
Eng & Maint	14.2	13.7	14.1	13.5	13.1	12.8	12.8	12.5
Sci & Prof	2.6	2.7	2.7	3.1	3.2	2.5	2.6	2.8
Health	18.0	18.2	18.6	19.6	20.1	22.0	24.0	24.5
Admin	10.0	9.7	9.3	9.5	9.5	9.2	8.9	8.7
Supply	13.8	14.1	14.7	14.7	15.0	15.3	14.7	14.1
Non-occ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Derived from data provided by DMDC.

minorities later in this study. For example, if the promotion rates for scientists and professionals were found to be low, it could be concluded that this is of little concern to the promotion of minorities because less than three percent of minorities are employed in that occupation.

The Navy data on the distribution of minority officers by occupation in Table 20 are also fairly similar to those of DoD and the Army. Tactical operations is the largest occupation, employing 28.2 percent of minority officers in 1994. The key difference is that this represents significant growth from only 18.1 percent in 1987 (opposite direction to that in the other services). Health again grew to about 23 percent, but administration and supply contracted from almost 26 percent to about 17 percent.

Table 20. Percent Distribution of Minority Commissioned Officers by Department of Defense Occupation, 1987-1994

Navy								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	2.5	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Tactical	18.1	28.6	29.2	28.7	28.9	29.4	30.1	28.2
Intelligence	2.3	2.0	2.1	2.4	2.6	2.8	2.9	3.3
Eng & Maint	22.8	8.1	8.2	8.2	8.1	8.2	8.6	9.2
Sci & Prof	9.5	5.1	4.7	4.5	4.6	4.5	4.4	4.5
Health	19.1	21.5	20.6	21.0	20.9	21.2	21.9	22.9
Admin	18.0	8.9	8.6	8.2	8.2	8.3	8.3	7.8
Supply	7.7	7.6	8.0	8.0	8.4	8.6	9.0	9.3
Non-occ	0.0	18.0	18.4	18.9	18.2	16.9	14.7	14.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Derived from data provided by DMDC.

The distribution of minority officers by occupation in the Marine Corps is presented in Table 21. In this case, tactical operations dominates the other occupations by employing approximately 40 percent of minority officers throughout the drawdown. Another significant difference in the Marine Corps is the fact that no minority officers at all are employed in the health occupations because medical support is provided by the Navy. This is an occupation that employs almost 25 percent of minority officers in the other services, so it changes the occupational distribution in the Marine Corps markedly. Administration and supply eased down from 30.5 percent in 1987 to 27.9 percent in 1994--the largest of the four services. The

Table 21. Percent Distribution of Minority Commissioned Officers by Department of Defense Occupation, 1987-1994

Marine Corps								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	0.9	1.1	0.7	0.8	0.9	1.2	1.4	1.7
Tactical	39.1	40.8	39.1	40.6	40.7	40.6	40.5	40.3
Intelligence	2.5	2.2	2.2	2.1	2.0	2.4	2.7	3.1
Eng & Maint	9.2	8.8	8.4	7.9	7.7	7.1	6.3	6.1
Sci & Prof	2.3	2.4	2.5	2.5	2.1	2.7	2.6	2.6
Health *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Admin	11.6	10.7	10.1	10.7	10.6	10.1	10.8	10.2
Supply	18.9	18.8	18.2	19.8	20.5	19.4	18.6	17.7
Non-occ	15.5	15.2	18.8	15.8	15.5	16.5	17.1	18.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* The Navy provides the Marine Corps with medical support.

Source: Derived from data provided by DMDC.

other occupations have an almost negligible contribution to the employment of minority officers.

Finally, the occupational distribution of minority officers in the Air Force (see Table 22) is a little different than that in the other services. Although tactical operations is the largest occupation for minorities in the Air Force, it only fluctuated around the 24 percent level. Similarly, health grew only modestly to about 20 percent, while administration and supply fell back from 32 percent to about 24 percent. Some of this slack was picked up by engineer/maintenance, which increased to over 20 percent during the drawdown (making the Air Force, proportionally, the largest employer of minorities in this occupation in DoD).

Table 22. Percent Distribution of Minority Commissioned Officers by Department of Defense Occupation, 1987-1994

Air Force								
DOD Occupation	1987	1988	1989	1990	1991	1992	1993	1994
General	0.7	0.1	0.1	0.1	0.1	0.1	0.1	0.3
Tactical	24.2	24.9	25.0	25.2	25.9	25.4	24.8	24.0
Intelligence	3.9	4.1	4.0	3.9	3.9	4.0	4.0	4.3
Eng & Maint	16.7	21.4	21.2	20.4	20.4	20.3	19.4	20.1
Sci & Prof	5.0	4.8	5.0	5.1	5.2	5.5	5.9	5.8
Health	15.5	15.9	16.5	17.8	17.7	18.4	19.7	19.8
Admin	23.6	15.4	14.6	13.9	13.7	13.5	12.5	12.7
Supply	8.6	11.2	11.2	11.1	11.0	11.2	11.5	11.6
Non-occ	1.8	2.2	2.4	2.5	2.1	1.6	2.1	1.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Derived from data provided by DMDC.

E. SUMMARY

It can be seen that the OMF provides some useful snapshots of the representation of officers across DoD throughout the drawdown. The restrictions that have been placed upon the OMF do not limit its usefulness for this research but rather improve the reliability of the data. The tabulations in this chapter serve to highlight the differences in both the size and extent of the drawdown between the four services and also among the various racial/ethnic groups. Furthermore, key occupational trends of the minority officers throughout the drawdown have been noted. This is important background information for the model specification process that is undertaken in Chapter V.

V. METHODOLOGY IN PROMOTION ANALYSIS

A. DESCRIPTION OF DATA: OFFICER COHORT FILES

Officer cohort files were created for the years 1977, 1980, 1983, and 1987. The project assembles data on promotion rates by service and by promotion point (O-3, O-4). These rates are analyzed to determine whether statistically significant differences exist between racial and ethnic groups, and to determine whether such differences have changed over time (that is, whether racial/ethnic differences are widening or narrowing throughout the drawdown).

These cohort files are essentially put into pairs for the purposes of this analysis. The 1977 and 1980 cohorts are used to assess O-4 promotion, while the 1983 and 1987 cohorts are used to examine O-3 promotion. In each pair, the former cohort is in zone for promotion prior to the drawdown, while the latter cohort reaches the promotion zone during the drawdown. In this way, the effect of the drawdown on the promotion to each rank can be estimated.

The study concentrates primarily on the O-4 outcomes, as this is clearly the most important obstacle for any officer in pursuing a 20-year career in the military. Promotion to O-5 is beyond the scope of this study, because so few officers from the 1980 cohort had been promoted by 1994 (less than one percent). This severe truncation problem renders any comparison with the 1977 cohort meaningless. Furthermore, the promotees in both cohorts have been promoted during the drawdown. A cohort from about 1973 (which would have come into zone for promotion prior to the drawdown) would have been required for the purpose of analyzing promotion to O-5.

B. LIMITATIONS OF THE DATA SET

1. Data Requirements

The limitations of the data set can only be determined when the requirements of the data for this analysis are considered. It is therefore appropriate to examine the theoretical promotion models. The two variables that are at play with respect to promotion behavior are how quickly promotion occurs (time) and how likely promotion is (probability).

This promotion behavior is governed by a vector of individual characteristics (X), a vector of occupational group indicator variables for each individual 'i' (Z), and promotion information (W). It is assumed that these variables affect both time to promotion and the probability--though these effects will not always be the same. For example, some occupational variables may have a greater impact on promotion time than on the likelihood of promotion. Conversely, educational variables may have a greater impact on promotion probability. None of these variables, however, should be mutually exclusive between the two models.

Promotion success can therefore be simply represented as:

$$Y_i = B_0 + B_1X + B_2Z + B_3W + e_i$$

where 'e' is an unobserved error term. This theoretical model provides a useful guideline for the selection and creation of more detailed variables to specify the promotion models. Ideally, the individual characteristics (X) should include the following:

- a. gender;
- b. ethnic/racial group;
- c. education level;
- d. undergraduate GPA and an indicator of college quality;
- e. commissioning source;

- f. indicators of performance prior to the promotion point (e.g., scores from fitness reports or FITREPs);
- g. indicators of stability (e.g., marital status);
- h. age at time of commissioning;
- i. whether or not the officer has prior enlisted service;
- j. measures of motivation and aptitude.

Occupational group indicator variables (Z) only require information on the occupation in which the officer is employed at the time he/she is in zone for promotion. Promotion information (W) that is relevant to promotion outcomes includes:

- a. whether an officer has already failed to be promoted once;
- b. number of recommendations for early promotion on his/her fitness reports;
- c. number of medals awarded; and
- d. completion of essential milestone qualifications or courses.

If all of these variables could be incorporated into the promotion models, most of the identifiable factors affecting promotion would be identified. This would minimize any indirect effects that might be reflected in the ethnic variables' coefficients, so that these coefficients actually portray the true direct effect of minority status on promotion outcomes.

2. Data Limitations

Unfortunately, the DMDC officer cohort files do not have all of the information listed above. Although only two of the nine individual characteristics variables are unavailable, they are probably the most important two of that group. The omission of undergraduate GPA and an indicator of college quality (which reflect education quality) represents a potential misspecification of the model. The absence of this information in the model is likely to overstate the importance of the ethnic variables because of possible differences in the quality of colleges attended by minorities and non-minorities and the GPAs of population subgroups (Armour-Lightner, 1985). This may reduce

the confidence that can be placed on the results of the models and must be taken into account when appraising estimated coefficients.

Similarly, the absence of any indicators of motivation, aptitude, and performance (namely, information from performance evaluations) is a concern. These factors are important determinants of promotion success, regardless of the ethnicity or race of the officers. This is a less serious problem, because a proxy variable designed to capture some of these effects can be created. This variable is called STUDY. A description of this variable and the rationale behind it is presented below.

The data set also places a limitation upon the occupational group indicator variables (Z). The most accurate form of this occupational information would be to have the occupation of each officer for the year in which he or she is first considered for promotion. The problem with this, however, is that in any given year within the data set, about 20 to 30 percent of the officers have an unknown occupation. To avoid losing such a large proportion of the sample, a different occupation variable was created. This variable looked for an occupation code at each year of an officer's career from the time of commissioning until an occupation code was found. Although this variable does not capture any changes in career stream, it did reduce the number of observations with unknown occupation to only 108. These records were deleted from the sample.

Finally, the officer cohort files do not have any of the promotion information variables (W). Again, these variables are a reflection of the motivation, aptitude, and performance of the officers. Although it is assumed that part of this influence will be captured in the STUDY variable, the potential limitations of this variable in satisfactorily reflecting these attributes must be recognized in the interpretation of the promotion models.

C. DEVELOPMENT OF MULTIVARIATE PROMOTION MODELS

1. Restrictions and Assumptions

A number of restrictions have been placed upon the officer cohort files:

- a. The paygrade in the officers' entry year must be O-1. This restriction eliminates warrant officers and officers of other ranks from the cohort (particularly professionals, such as doctors and lawyers who may be fast-tracked to O-4). It therefore provides a more homogeneous group of officers who can justifiably be compared on their merits for promotion.
- b. The month and year of entry variables must produce an entry date that falls within the fiscal year of that cohort. This restriction ensures that all observations are valid members of a cohort group. (Some entry dates went as far back as the 1950s.)
- c. Officers with an occupation code of zero, one, or nine were restricted from the sample. (These are unknown, general, and non-occupational, respectively.) Occupation codes of unknown and non-occupational do not provide any worthwhile information about the officers concerned. At the same time, for this sample, an occupation code of general (or flag officer) must be a mistake. The remaining sample is distributed among seven clearly defined occupations.

These restrictions considerably reduced the number of observations, as reflected in Table 22. However, the restricted sample is still of sufficient size to support the statistical modeling and to provide representative samples for all demographic groups.

The main assumption that is made in the models concerns promotion zones. Promotion zones are important because it is at this time that officers can confirm whether or not they will be able to get promoted and continue to serve in the military. Furthermore, promotion rates are generally calculated as the

Table 22. Number of Officers in Officer Cohort Files (1977, 1980, 1983, 1987) Before and After Restrictions

Cohort Year	A. Total Number of Officers	B. Restricted Number of Officers	Difference (A minus B)
1977	25,335	14,909	10,426
1980	29,434	18,848	10,586
1983	29,264	20,034	9,230
1987	22,646	12,877	9,769

Source: Derived from data provided by DMDC.

percentage of officers in zone that are promoted. For a DoD-wide study, this is complicated by the fact that the separate services have different minimum time-in-rank periods, causing promotion zones to fall at different times. None of the services customarily consider an O-3 for promotion to O-4 within the individual's first four years of time-in-grade. Therefore, it is assumed that any officer who leaves the military within this period has not done so because of failure to be selected for promotion. Officers who resign after this time are assumed to have done so because they have either failed to be promoted or they realize that they are unlikely to be promoted in the future. It is against this pool of officers who serve beyond four years as an O-3 that the promotion rates to O-4 are calculated.

2. Dependent Variables

The dependent variables in the promotion models are TIME4 and PROM4. TIME4 is a continuous variable reflecting the number of months of commissioned service to O-4 promotion. This is the dependent variable for the OLS regression models. PROM4 is a dummy variable, coded with a value of one for officers who are promoted to O-4 (zero for those who do not) within the arbitrary time period adopted for all O-3 officers who serve at

least four years in grade. This is the dependent variable for the logistic models. The same methodology is applied to the creation of dependent variables for the O-3 promotion models (TIME3 and PROM3, respectively).

3. Explanatory Variables

a. Dummy Variables

All but one of the explanatory variables in the promotion models are dummy variables. A description of these variables is presented below:

i. **FEMALE** -- This variable is designed to capture the effect of gender on promotability. The reference group is the male officer population.

ii. **ETHNIC** -- This variable seeks to identify the effect of ethnicity on promotion outcomes. Blacks, Hispanics, and others (Asians, American Indians, and Pacific Islanders) are targeted against the reference group of white officers.

iii. **POSTGRAD** -- Officers who entered the military with a postgraduate degree are compared with all other officers in their cohort. Hence, the importance of having advanced education before commissioning can be assessed.

iv. **STUDY** -- The impact of completing a postgraduate degree while on active duty is isolated by this variable. Perhaps more importantly, though, is the assumption that this variable serves as a proxy for an individual's motivation, aptitude, and performance that cannot be observed directly due to the absence of information from officer performance appraisals. This variable identifies all officers who are selected for funded graduate education by the services. These officers are generally selected because they are high performers. It also identifies officers who take on the study commitments themselves, which, without discounting the possibility that they are high

performers, is a display of motivation to one's career and personal productivity.

v. **ACADEMY** -- A commissioning source variable that compares the promotability of graduates of the service academies to those of Officer Candidate School (OCS).

vi. **ROTC** -- A commissioning source variable that compares the promotability of graduates of ROTC programs to those of OCS programs.

vii. **MARRIED/CHILDREN** -- These variables are designed to be indicators of personal stability. Across a large group of people, it is hypothesized that officers who are married and/or have children are generally more stable and career-minded. The reference populations are simply those officers who are not married and those without children, respectively.

viii. **PRIORSVC** -- Officers with prior enlisted service are differentiated by this variable to assess the impact of enlisted experience on promotability as an officer.

ix. **OCCUPATION** -- Six of the seven occupation groups (tactical operations, intelligence, engineer/maintenance, science and professional, health, and supply) were included in the promotion models. Administration was excluded as the reference group. These variables highlight the potential importance of the different occupations on promotion outcomes.

x. **SERVICES** -- Dummy variables for the Navy, Marine Corps, and Air Force were specified for the unrestricted models. The sample of ethnic officers (particularly Hispanics and others) are too small to run promotion models by racial/ethnic group for each service. Only a general DoD model can be restricted by racial/ethnic group. Because there are distinct differences in the promotion behavior of the services,

these variables are required to hold that behavior constant.

b. Continuous Variable

The only continuous variable in the promotion models is AGE. This variable records the age of an officer at the time of commissioning in an entry year. Although people can benefit from added experience and maturity, the military is a fairly youthful organization. It is hypothesized that being considerably older than the average age of officers in one's peer group may influence the probability of promotion.

4. A Priori Expectations

The models, therefore, assess the effect of minority status on promotion while holding constant the following factors: gender, education, performance/aptitude (STUDY), commissioning source, marital and parental status, prior service, age at entry year, occupation, and service. The null hypothesis is that minority status will not, in itself, have a significant direct effect across the models. This is because poor promotion performance is normally attributed to factors such as lower education levels and being in an occupation or service with a "tight" promotion structure. These factors are accounted for in the promotion models.

E. STATISTICAL PROCEDURES: OLS AND LOGIT

The OLS regression models assess the importance of the determinants of the time to promotion as O-3 and O-4. The coefficients of the significant variables indicate the change in time (in months) associated with each variable, holding all other factors constant. At first glance, this may seem to be of incidental importance, since promotion times can vary so much according to occupation and service. However, these variables are also held constant in the models. It is not a great concern if minorities have been getting promoted a month or two slower than non-minorities. If the lag is about six months or more, however, it might reveal that more minority officers are not

being selected on their first look before the promotion boards. In this case, the OLS coefficients may yield some insight as to how to resolve promotion discrepancies.

The logit models examine the determinants of the probability of promotion. In this case, the coefficients of the significant variables are converted into the percentage change in the probability of promotion. This is done by multiplying the coefficient by the overall sample promotion rate and then multiplying the product by the reciprocal of the promotion rate. The effect of each explanatory variable on promotion can then be compared.

The statistical significance of the OLS and logit coefficients are assessed at the 0.05 level of significance. This removes the temptation to adjust the level of significance to suit the output and interpretations of the models. Furthermore, Chow tests and log likelihood ratio tests are conducted on the OLS and logistic models, respectively. These tests help to establish if the determinants and outcomes of the promotion process are significantly different over time or between sub-groups (that is, whether or not their difference can be purely attributed to statistical error). Specifically, they attempt to see if the relationship between the explanatory and dependent variables are stable over time, or across sub-samples. If they are not, then one equation or model cannot be used to explain the relationship over the whole time period (before and during the drawdown) or sample (across the various ethnic groups and services). This information provides insight into the impact that the drawdown has had on the promotion outcomes. It also illustrates how different the determinants of promotion are between the officers of different racial/ethnic groups and services.

VI. ANALYSIS OF PROMOTION OUTCOMES

A. PRELIMINARY DATA ANALYSIS

1. Promotion Times

It is appropriate, at this point, to look at the promotion rates throughout the drawdown that are generated by the promotion variables described in Chapter V. This clarifies the extent of any unadjusted disparities in promotion outcomes. The statistical modeling process then tries to explain the disparities and identify any changes in the determinants of promotion.

Table 23 presents the average promotion times in months to O-3 and O-4 for the major racial/ethnic groups (a table of promotion times by service is pointless because different time-in-grade policies ensure diverse outcomes that are unrelated to individual performance). The percentages in bold with an asterisk are unequal (compared with the remainder of the cohort) at a 0.05 level of significance in a T-test of means.

It can be seen that although Hispanics had significantly slower promotion time to O-3 in the pre-drawdown cohort (1983), the three-month differential is not of any practical significance. The promotion rates of the ethnic groups to O-3 during the drawdown (1987 cohort), however, are equal in both statistical and practical terms. Unless there are large differences in the characteristics of these groups (such as education levels or performance), this has become a more equitable outcome during the drawdown.

As would be expected, there is a lot more variation in the promotion times to O-4. However, the statistical significance of the variation is largely maintained into the drawdown, with all promotion times slowing. Whites are still promoted significantly faster, while blacks and others are promoted significantly slower. Blacks are promoted to O-4, on average, about five months slower than are whites. This may be

partly associated with their relatively high representation in the Army, which is one of the slower promoting services. Otherwise, this is a concern since it indicates that a much higher proportion of black officers are failing to select for promotion during their first chance.

Table 23. Mean Time (in Months) to Promotion to O-3 and O-4, by Racial/Ethnic Group and Entry Cohort

Time to Promotion: O-3					
Cohort	All	White	Black	Hispanic	Other
1983	50	49	49	52 *	50
1987	51	51	51	51	51

Time to Promotion: O-4					
Cohort	All	White	Black	Hispanic	Other
1977	132	132 *	135 *	137 *	135 *
1980	139	138 *	143 *	139	141 *

* The percentages with an asterisk are unequal to the remainder of the cohort group at 0.05 level of significance in a T-test.
Source: Derived from data provided by DMDC.

2. Promotion Rates

Table 24 displays the promotion rates by racial/ethnic group for those officers who survived to the O-3 or O-4 point. Again, the percentages in bold are those that differ from the remainder of the sample at the 0.05 level of significance. The most conspicuous finding is with respect to black officers: they are the only group that has been promoted to O-3 at a statistically significantly lower rate than the other racial/

ethnic groups throughout the period of observation. However, there has been a significant improvement in the promotion rates of black officers to O-4 during the drawdown. The deterioration of the promotion rates of the other groups is also a concern, as they appear to be the only group that has been adversely affected, in relative terms, in promoting to O-4 during the drawdown.

Table 24. Average Rate (Percent) of Promotion to O-3 and O-4, by Racial/Ethnic Group and Entry Cohort

Rate of Promotion: O-3

Cohort	All	White	Black	Hispanic	Other
1983	86.5	87.9	83.7 *	85.2	88.0
1987	87.1	86.0	81.7 *	87.4	85.1

Rate of Promotion: O-4

Cohort	All	White	Black	Hispanic	Other
1977	76.1	77.4 *	63.5 *	77.3	69.4
1980	68.4	68.7	67.6	67.5	62.9 *

* The percentages with an asterisk are unequal to the remainder of the cohort group at 0.05 level of significance in a T-test.

Source: Derived from data provided by DMDC.

Promotion rates by service are shown in Table 25. With the exception of Army, the O-3 promotion rates have been largely unaffected by the drawdown. A diversity in promotion rates still exists. At the O-4 level, however, the Navy's promotion rates resisted some of the downward pressure of the drawdown, and appear considerably higher than those of the other services

(which are grouped closely together). The Air Force's promotion rates dropped sharply from about 77 percent to 67 percent. The Marine Corps' O-3 and O-4 promotion rates have remained relatively stable throughout the drawdown. (These findings confirm the need to account for an officer's service in the promotion models.)

Table 25. Average Rate (Percent) of Promotion to O-3 and O-4, by Service and Entry Cohort

Rate of Promotion: O-3					
Cohort	All	Army	Navy	Marine Corps	Air Force
1983	86.5	80.9	86.5	77.0	92.2
1987	87.1	72.6	86.1	75.8	91.1

Rate of Promotion: O-4					
Cohort	All	Army	Navy	Marine Corps	Air Force
1977	76.1	71.5	82.1	66.2	77.1
1980	68.4	64.9	76.7	66.9	66.8

Source: Derived from data provided by DMDC.

There are also differences in promotion rates to O-4 between the DoD occupations. These rates are presented in Table 26. Table 13 in Chapter IV shows that the highest representation of minorities across DoD is in administration and supply. These occupations have the lowest O-4 promotion rates for the cohorts who were in-zone prior to and during the drawdown period. The remaining occupations had very similar promotion rates in the

1977 cohort. The health field defied the trend of the other occupations by actually having its promotion rate rise for those evaluated during the drawdown. The remaining occupations experienced reductions of similar proportions. Given that the representation of minority officers in health has risen throughout the drawdown to over 15 percent of all health officers, one can argue that minority officer promotion has generally not been hampered by occupational trends.

Table 26. Average Rate (Percent) of Promotion to O-4, by DoD Occupation, 1977 and 1980 Cohorts

DoD Occupation	1977 Cohort	1980 Cohort
Tactical	76.2	69.7
Intelligence	76.4	68.4
Eng & Maint	76.2	66.5
Sci & Prof	77.0	66.4
Health	76.6	77.1
Admin	73.3	64.6
Supply	71.9	62.6
Total	75.7	68.3

Source: Derived from data provided by DMDC.

Having seen differences in the promotion rates across DoD between the racial groups and the services, it is appropriate to consider the differences by race in each of the services. It can be determined whether minority promotion rates in each service are proportionately affected by the difference in the rates of each service. In some cases, particularly in the Marine Corps, the numbers of Hispanic and other officers are too small to support promotion models restricted by service and race.

Similarly, in Tables 27 through 30, some of the rates are abnormal (high or low) because of small sample sizes. Consequently, an additional column has been added called "Ethnic". This is the average promotion rate of the three minority groups. While not being as sensitive to the racial differences, this column is less vulnerable to sample size problems and, therefore, provides more reliable percentages.

Table 27 presents promotion rates by racial/ethnic group for the Army. As seen here, blacks were promoted to O-3 at a much lower rate than all other ethnic groups. Hispanics and others, however, are the most successful -- even more so than whites. Consequently, the ethnic and non-ethnic (white) rates are comparable.

Table 27. Average Rate (Percent) of Promotion to O-3 and O-4, by Racial/Ethnic Group and Entry Cohort

Army: O-3

Cohort	White	Black	Hispanic	Other	Ethnic *
1983	83.1	81.7	91.7	90.6	84.8
1987	72.7	67.4	90.0	81.3	72.1

Army: O-4

Cohort	White	Black	Hispanic	Other	Ethnic *
1977	73.4	65.7	75.4	64.9	67.0
1980	65.1	66.8	80.0	54.3	62.4

* "Ethnic" is the average promotion rate for all minority officers.

Source: Derived from data provided by DMDC.

Ethnics have not been as successful as whites at the O-4 level. Moreover, the ethnic groups have been affected differently through the drawdown years. Promotion rates have improved for Hispanics, remained fairly constant for blacks, and fallen for others. Most importantly, blacks and Hispanics have generally been just as likely to be promoted to O-4 in the Army during the drawdown (as compared with DoD as a whole), even though the Army promotes at a lower rate than the other services. The gap between the promotion rates of ethnics and whites has narrowed markedly in the drawdown.

Navy promotion rates by racial/ethnic group are shown in Table 28. Promotion rates for O-3 are generally unchanged through the drawdown. White officers have been promoted at about 3.4 percentage points higher rate than that of ethnic officers

Table 28. Average Rate (Percent) of Promotion to O-3 and O-4, by Racial/Ethnic Group and Entry Cohort

Navy: O-3

Cohort	White	Black	Hispanic	Other	Ethnic *
1983	86.8	83.8	80.0	85.8	83.5
1987	86.4	83.3	84.2	81.4	83.0

Navy: O-4

Cohort	White	Black	Hispanic	Other	Ethnic *
1977	82.7	68.7	84.4	68.2	72.3
1980	77.1	68.0	63.3	79.2	70.6

* "Ethnic" is the average promotion rate for all minority officers.

Source: Derived from data provided by DMDC.

(86.4 percent versus 83.0 percent, respectively)--much higher than the DoD average differential of 1.9 percent. Even though Navy has the highest promotion rates of all services by a considerable margin, the promotion of black Naval officers to O-4 is similar to the rates experienced by blacks in the Army. Therefore, black Naval officers are being promoted poorly, in relative terms. Hispanic O-4 promotion rates have tumbled in the drawdown while the promotion of the others has risen above the level of white officers. The Navy has the largest disparity in promotion rates between whites and minorities at the O-4 level during the drawdown.

Marine Corps promotion rates by race (see Table 29) reflect some of the trends displayed in the Navy. In this case, though, the small sample size of the Hispanics and others

Table 29. Average Rate (Percent) of Promotion to O-3 and O-4, by Racial/Ethnic Group and Entry Cohort

Marine Corps: O-3

Cohort	White	Black	Hispanic	Other	Ethnic *
1983	78.8	47.6	82.4	64.3	60.4
1987	76.8	67.4	77.8	55.6	67.0

Marine Corps: O-4

Cohort	White	Black	Hispanic	Other	Ethnic *
1977	67.6	34.8	62.5	50.0	42.9
1980	66.7	66.7	66.7	80.0	69.6

* "Ethnic" is the average promotion rate for all minority officers.

Source: Derived from data provided by DMDC.

necessitates making the comparisons between the whites and ethnics. The promotion rates to O-3 and O-4 for whites fell marginally during the drawdown. This is in contrast to the promotion rates for ethnic officers, which rose considerably during the period. As in the Navy, ethnic officers are still less successful in promoting to O-3; however, they are more successful in promoting to O-4 in the Marine Corps in the drawdown.

This is also the promotion experience of minority officers in the Air Force (Table 30). Promotion rates for minorities rose during the drawdown at the O-3 and O-4 levels, yet were one percentage point higher and one percentage point lower, respectively, than the promotion rates of white officers during the drawdown. The promotion rates of the three minority

Table 30. Average Rate (Percent) of Promotion to O-3 and O-4, by Racial/Ethnic Group and Entry Cohort

Air Force: O-3

Cohort	White	Black	Hispanic	Other	Ethnic *
1983	92.6	89.2	89.2	88.9	89.1
1987	91.0	90.6	94.4	93.1	92.1

Air Force: O-4

Cohort	White	Black	Hispanic	Other	Ethnic *
1977	78.5	61.7	77.8	76.1	66.8
1980	66.9	68.0	67.5	67.6	67.9

* "Ethnic" is the average promotion rate for all minority officers.

Source: Derived from data provided by DMDC.

groups to O-3 all improved during the drawdown, but this was not the case for Hispanics and others with respect to O-4 promotion. However, this trend did not adversely affect these groups relative to the white officers. Promotion rates to O-4 by race became more uniform in this period.

When assessing the impact of the drawdown on the promotion of minority officers, there is one major conclusion that is evident across all of the services: the promotion rates of minority officers to O-4 improved relative to the promotion rates of white officers (even in the Army and Navy, where minority officers still have lower promotion rates than their white counterparts). Irrespective of whether the data in the next section suggest that there is any bias against minority officers in the promotion process, this conclusion still holds, and it suggests that the drawdown process is not associated with any adverse impact on minority promotion as a whole.

B. PROMOTION TIME MODEL OUTCOMES (OLS)

The OLS promotion time tables that follow (Tables 31 through 35) present only the coefficients of the significant variables (at the 0.05 level of significance). The full OLS results for the DoD models are presented in Appendices A and B. The coefficients of the variable AGE can be interpreted as the additional months to promotion that are associated with each additional year of age at entry, holding all other variables constant. Similarly, the coefficients of the dummy variables reflect the change in promotion time that is associated with being in a given status (e.g. being married), holding the others constant.

1. O-3 Promotion Time

The data in column 1 of Table 31 support the a priori expectations. Prior to the drawdown (the 1983 cohort), race was not a significant factor across DoD and was only associated with small deviations in promotion time in the Navy and Army. The only statistically significant variable with any practical

Table 31. O-3 Promotion Time Model, Coefficients of Significant Variables (at 0.05), 1983

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	0.5	0.6	-	-	-	-	0.6	-	-	-
Ethnic	-	NA	NA	NA	NA	NA	-0.6	1.3	-	-
Postgrad	-3.7	-3.5	-6.4	-5.1	-	-8.2	-	-	-4.7	-3.0
Study	-	-	-0.9	-	-	-	-	-	-	-
Academy	-1.2	-1.1	-1.9	-	-	-2.6	-1.1	-	-	-1.7
ROTC	-1.0	-1.0	-1.2	-	-2.0	-1.7	-0.8	-	1.5	-2.0
Married	-	-	-	-	-	-	-	-0.6	-	-0.5
Children	-	-	-	-	-	-	-	-	-	-
Priorsvc	3.5	3.7	2.0	1.8	-	3.2	4.0	4.4	-	3.1
Age	0.1	0.1	-	-	-	-	0.2	-	-	0.2
Tactical	1.1	1.1	-	-	-	2.9	-	-	-	1.9
Intel	-	-	-	-	-	-	-	-	-	-
Engmaint	-	-	-	-	-	-	-1.5	-0.9	-	0.7
Sciprof	-3.3	-3.3	-3.7	-4.0	-	-4.7	-1.8	-13.4	-27.9	-
Health	-1.7	-1.5	-2.3	-3.3	-	-	-2.1	-3.8	-	-
Supply	-	-	-	-	-	-	-	-	-	-
Navy	1.3	1.4	-	-	-	-	NA	NA	NA	NA
Marines	10.6	10.7	9.3	9.4	8.5	10.0	NA	NA	NA	NA
Airforce	-	-	-	-	1.6	-	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

significance was service in the Marine Corps, with a nine to ten month slower promotion time to O-3. This is not a concern, however, because it is systematic of being a Marine, and it affects the entire peer group. Minority officers with postgraduate education at the entry year benefited more from this education in terms of promotion speed than did white officers.

The O-3 promotion data during the drawdown (1987 cohort) are displayed in Table 32. Although minor in scale, the two most important changes from results shown for the earlier cohort (Table 31) are that equally qualified and experienced female officers are no longer being promoted slower than men (FEMALE in the DoD model is now insignificant), while similarly credentialled minority officers are now being promoted faster than their white officers (ETHNIC in the DoD model now has a significantly faster promotion time). The relative value of POSTGRAD has improved for minority officers, although it has fallen in absolute terms. The Army has become a relatively much slower promoter during the drawdown than have the other services, as evidenced by the changing sign of the coefficients for the services (the Army is the reference group and the negative values for the other services indicate that they are all promoting their officers relatively faster).

The Chow test (Gujarati, 1988) results are presented in Table 33. All of the tests for the 1983 and 1987 O-3 cohorts reject the null hypothesis (H_0) that the coefficients of the explanatory variables in the promotion time models for the respective sub-samples are equivalent. It can be argued that during the drawdown, the determinants of O-3 promotion changed significantly for all racial/ethnic groups and for each service (lines 1-20). Similarly, a statistically significant difference was maintained in each O-3 cohort between white and minority officers (lines 23 and 24). This reinforces the significance of the improvement in O-3 promotion time that was experienced by minority officers during the drawdown (Table 32).

Table 32. O-3 Promotion Time Model, Coefficients of Significant Variables (at 0.05), 1987

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	-	-	-	-	-	-	-	-	-	-
Ethnic	-0.4	NA	NA	NA	NA	NA	-	-	-	-
Postgrad	-2.2	-1.7	-4.7	-	-9.1	-7.0	-	-5.8	-13.5	-1.7
Study	-1.0	-1.0	-	-	-	-	-2.4	-3.0	-	-0.7
Academy	0.5	0.6	-	-	-	-	-1.0	11.5	3.1	-1.8
ROTC	-0.9	-0.8	-1.8	-2.9	-	-	-1.0	1.6	3.5	-1.6
Married	-	-	-	-	-	-	-	-0.6	-	0.5
Children	-0.4	-0.4	-	-	-	-	-0.7	-	-	-
Priorsvc	2.7	3.0	-	-	2.7	-	3.4	-	-	3.4
Age	0.1	0.1	-	-	-	-	0.3	-	-0.6	0.2
Tactical	1.4	1.3	-	-	-	-	-	-2.8	-	2.3
Intel	-	-	-	-	-	-	-	-	-	-
Engmaint	-	-	-	-	-	-	-1.2	-	-	1.0
Sciprof	-	-	-3.3	-	-	-5.6	-	-	-10.2	1.7
Health	-2.0	-1.6	-4.1	-4.0	-	-6.3	-	-8.3	-	-1.1
Supply	-	-	-	-	-	-	-	-2.6	-	-
Navy	-10.0	-10.2	-8.6	-8.2	-	-9.0	NA	NA	NA	NA
Marines	-4.1	-4.0	-5.0	-3.7	-	-8.7	NA	NA	NA	NA
Airforce	-10.5	-10.6	-9.5	-9.6	-4.4	-10.6	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

Table 33. Chow Test Outcomes for OLS Promotion Models,
0.05 Level of Significance

Sub-samples tested		Accept H_0	Reject H_0
1.	DoD: 1977 & 1980		X
2.	DoD: 1983 & 1987		X
3.	Ethnic: 1977 & 1980		X
4.	Ethnic: 1983 & 1987		X
5.	White: 1977 & 1980		X
6.	White: 1983 & 1987		X
7.	Black: 1977 & 1980		X
8.	Black: 1983 & 1987		X
9.	Hispanic: 1977 & 1980		X
10.	Hispanic: 1983 & 1987		X
11.	Other: 1977 & 1980		X
12.	Other: 1983 & 1987		X
13.	Navy: 1977 & 1980		X
14.	Navy: 1983 & 1987		X
15.	Army: 1977 & 1980		X
16.	Army: 1983 & 1987		X
17.	Marines: 1977 & 1980	X	
18.	Marines: 1983 & 1987		X
19.	Air Force: 1977 & 1980		X
20.	Air Force: 1983 & 1987		X
21.	White/ethnic: 1977		X
22.	White/ethnic: 1980	X	
23.	White/ethnic: 1983		X
24.	White/ethnic: 1987		X

Source: Derived from data provided by DMDC.

2. O-4 Promotion Time

The trends in the determinants of O-4 promotion time are similar to those revealed for the paygrade of O-3. The model results for the pre-drawdown (1977) cohort are shown in Table 34. Although minority status for the 1977 cohort was associated with faster promotion in the Marine Corps, this was not a significant factor across DoD. The importance of POSTGRAD on promotion time was limited to the others component of minority officers (nine months faster). The health occupation was associated with particularly fast promotion to O-4 for minority officers. Service differences were also significant.

The determinants of O-4 promotion during the drawdown for the 1980 cohort are displayed in Table 35. The slower promotion time that was associated with female status before the drawdown (see Table 34) is no longer evident. On the other hand, minority status is now associated with slower promotion in the Army and the Air Force, making it a significant variable for the DoD model. The Navy is now the only service with significantly faster promotion than the reference group (Army).

Referring back to Table 33, it can be seen that the Chow test outcomes tell a slightly different story. Serials 21 and 22 suggest, for whites and minorities, that although their relationship between promotion time to O-4 and their respective explanatory variables were statistically different for the 1977 cohort (pre-drawdown), this is no longer the case in the drawdown. Even though the promotion determinants for each racial group (and for all services other than the Marine Corps), have changed during the period of the drawdown (see serials 1-20), the drawdown has been associated with a smoothing out in the differences between the promotion behavior of white and minority officers. When consideration is also made of the fact that the promotion time to O-3 has become relatively more favorable for minority officers during the drawdown, it can be argued that the impact of the drawdown on promotion times of minorities, in general, has been positive. However, given the fairly small

Table 34. O-4 Promotion Time Model, Coefficients of Significant Variables (at 0.05), 1977

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	1.2	1.3	-	-	-	-	3.7	-	-	-
Ethnic	-	NA	NA	NA	NA	NA	-	-	-3.4	-
Postgrad	-3.9	-3.9	-3.8	-	-	-9.0	-	-2.7	-	-3.6
Study	-	-	-	-2.0	-	-	-	-	-	-0.9
Academy	-0.9	-1.0	-	-	-	-	-	-2.3	-	-1.5
ROTC	1.2	1.2	-	-	-	-	1.9	-	-	-
Married	-	-	-	-	-	-4.6	-	-	-	-
Children	-	-	-	-	-	-	-	-	-	-
Priorsvc	-0.9	-0.9	-	-	-	-	-3.2	-	-	-
Age	0.1	0.1	-	-	-	-	0.3	-	-	-0.3
Tactical	-1.4	-1.4	-	-1.9	-	-	-3.2	-	-	-1.9
Intel	-2.1	-2.0	-	-	-	-	-8.2	-	-	-
Engmaint	-2.3	-2.4	-	-	-	-	-6.3	-	-	-1.1
Sciprof	-	-	-	-	-	-	-	-8.9	-	-
Health	-5.5	-4.9	-12.1	-10.2	-9.8	-16.9	-	-7.3	-	-14.0
Supply	-	-	-	-	-	-	-	-	-	-
Navy	-26.6	-26.7	-26.4	-25.6	-28.6	-26.4	NA	NA	NA	NA
Marines	3.4	3.5	-	-	-	-	NA	NA	NA	NA
Airforce	-10.2	-10.3	-9.8	-9.3	-12.3	-7.5	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

Table 35. O-4 Promotion Time Model, Coefficients of Significant Variables (at 0.05), 1980

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	-	-	-	-	-	-	-	-	-	-
Ethnic	1.0	NA	NA	NA	NA	NA	-	1.5	-	1.0
Postgrad	-	-	-	-	-	-	-	-	-	-
Study	-	-	-	-	-	-	1.4	-0.9	-	-
Academy	-1.0	-0.9	-2.5	-	-	-3.7	-	-2.8	1.2	-
ROTC	-0.7	-0.6	-	-1.6	-	-	-	-	-	-1.9
Married	-	-	-2.0	-	-	-	1.8	-	-	-
Children	-	-	-	-	-	-	-	-	-	-
Priorsvc	-1.2	-1.2	-	-1.9	-	-	-	-	-	-1.9
Age	-	-	-	-	-	-	0.3	-	-	-
Tactical	-1.5	-1.7	-	-	-	-	-7.1	-	-	-1.0
Intel	-1.8	-1.9	-	-	-	-	-10.8	-	-	-
Engmaint	-	-0.7	-	-	-6.9	-	-6.9	-	-	-
Sciprof	-1.5	-2.0	-	-	-	-	-5.9	-13.9	-	-
Health	-9.2	-9.1	-10.5	-8.9	-	-13.5	-9.2	-5.9	-	-14.0
Supply	-	-	-	-	-	-	-	-	-	-
Navy	-22.3	-22.1	-23.0	-21.9	-26.3	-22.9	NA	NA	NA	NA
Marines	2.2	2.4	-	-	-	-	NA	NA	NA	NA
Airforce	-0.5	-	-	-	-	-	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

differences in promotion times that were apparent in the models, the more important outcomes on the success of military careers are the promotion rates.

C. PROMOTION LIKELIHOOD MODEL OUTCOMES (LOGIT)

1. O-3 Promotion Likelihood

Table 36 shows the determinants of promotion for the O-3 promotion rate models for the 1983 cohort (the full results for the DoD logit model are presented in Appendix C). The most notable factors are:

- a. women of other racial groups and those in the Navy are more likely to be promoted than are men;
- b. the effect of minority status is not significant across DoD, yet it is associated with an increased promotion probability in the Army and a lower promotion probability in the Navy and Marine Corps (particularly for Hispanic officers);
- c. service academy graduates tend to be promoted at a much higher rate than officers from other commissioning sources; and
- d. most of the occupations are associated with increased promotion probability over the reference occupation (administration).

The 1987 cohort models (Table 37) show that the effect of gender on the likelihood of promotion to O-3 in the drawdown years has disappeared altogether. Once again, minority status is not associated with changes in the probability of promotion at the DoD level, but it is significant for the Marine Corps and Air Force. The significance of the occupational variables and of graduating from an academy are considerably reduced. The variable STUDY (proxy for a performance indicator) has become the single most important explanatory variable. For white officers in the Army and the Air Force, this variable increases the likelihood of promotion by over 30 percent. MARRIED and CHILDREN

Table 36. Percent Change in O-3 Promotion Rate for Significant Variables (at 0.05), 1983

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	-	-	-	-	-	17.2	3.9	-	-	-
Ethnic	-	NA	NA	NA	NA	NA	-5.9	4.9	-16.4	-
Postgrad	-	-	-	-	-	-	-	-	-	-
Study	-	-	-	-	-	-	-	-	-	-
Academy	22.8	24.0	18.5	-	-	10.8	22.2	36.8	-	11.3
ROTC	-	-	-	-	-	-	-	-	-	-
Married	-	-	-	-	-	-	-	-	-	-
Children	-	-	-	-	-	-	-	-	-	-
Priorsvc	-2.2	-2.4	-	-	-	-	-	-	-	-
Age	-0.4	-0.3	-0.9	-1.2	-	-	-0.9	-	-	-0.6
Tactical	9.6	9.7	9.1	8.7	-	285.0	11.1	-	17.3	13.1
Intel	3.6	4.2	-	-	-	305.7	-	-	-	4.5
Engmaint	-	-	-	-	-	299.0	-6.4	-	-	-
Sciprof	4.6	-	35.1	-	-	285.1	-	-	-	-
Health	3.4	3.5	-	-	-	309.8	-	8.5	-	-
Supply	-	-	-	-	-	-	-	-	-	-
Navy	4.8	5.9	-	-	-	-	NA	NA	NA	NA
Marines	-2.3	-	-19.6	-	-30.3	-	NA	NA	NA	NA
Airforce	13.9	14.9	-	-	-	-	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

Table 37. Percent Change in O-3 Promotion Rate for Significnat Variables (at 0.05), 1987

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	-	-	-	-	-	-	-	-	-	-
Ethnic	-	NA	NA	NA	NA	NA	-	-	-12.2	3.1
Postgrad	-	-	-	-	-	-	-	-	-	-
Study	34.5	32.7	-	-	-	-	-	34.1	-	31.8
Academy	5.6	5.6	-	-	-	26.2	13.8	-11.5	-	16.8
ROTC	-	-	-	-	-	-	-	-	-	-
Married	22.4	22.6	21.3	22.0	15.9	26.9	23.2	24.6	21.5	32.7
Children	12.4	12.6	12.5	-	-	-	-	20.5	22.4	10.0
Priorsvc	-	-	-	-	-15.1	-	-2.7	-	-	-
Age	-	-	-	-	-	-	-	-	-	-
Tactical	7.6	8.2	-	-	-	-	-	17.6	26.8	5.0
Intel	-	-	-	-	-	-	-	18.1	-	-
Engmaint	-	-	-	-	-	-	-	-	-	-
Sciprof	-	-	-	-	-	-	-9.4	-	-	-
Health	-	-4.6	-	-	-	-	-	-	-	-4.6
Supply	-	-	-	-	-	-	-	-	-	-
Navy	18.5	18.6	18.8	22.8	-	-	NA	NA	NA	NA
Marines	5.5	6.5	-	-	-	-	NA	NA	NA	NA
Airforce	20.0	19.9	22.5	24.0	-	22.9	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

(stability measures) have also become significant across the 1987 cohort models. It appears that in the more competitive promotion environment of the drawdown, promotion boards may be placing a relatively high value on personal or career stability. This is not to say that promotion boards specifically look to see if an officer is married or has children. Rather, over large groups of people, these traits tend to be associated with a greater degree of career commitment and stability. Gender, ethnic status, commissioning source, and occupation are less important because the drawdown is affecting all of these groups in a fairly even-handed manner.

The log likelihood ratio tests (Gujarati, 1988) are presented in Table 38. The logistic models required for these tests could not converge for the minority group restricted models. However, the log likelihood ratio tests for DoD and each of the services (1983 and 1987) reject the null hypothesis (H_0) that their relationships before and during the drawdown are equal. This confirms the finding that the variables affecting promotion outcomes have changed fundamentally during the drawdown.

2. O-4 Promotion Likelihood

The significant variables influencing the probability of promotion to O-4 in the 1977 cohort are shown in Table 39 (the full model results for all of the O-4 promotion probability models are shown in Appendices D through M). Being female was associated with an increased likelihood of promotion for whites in the Navy and the Army (but not for minorities). Minority status was associated with large reductions in the probability of promotion in the Navy, Marine Corps, and the Air Force. The performance and stability proxies were the most important remaining variables (like the trends of the O-3 promotion models during the drawdown), reflecting the fact that even before the drawdown, promotion to O-4 was a competitive process.

The impact of the drawdown period on O-4 promotions can be assessed in Table 40. The positive influence of gender on

Table 38. Log Likelihood Ratio Test Outcomes for Logit
Promotion Models, 0.05 Level of Significance

Sub-samples tested		Accept H_0	Reject H_0
1.	DoD: 1977 & 1980		X
2.	DoD: 1983 & 1987		X
3.	White: 1977 & 1980		X
4.	Ethnic: 1977 & 1980	X	
5.	Black: 1977 & 1980	X	
6.	Hispanic: 1977 & 1980	X	
7.	Other: 1977 & 1980	X	
8.	Navy: 1977 & 1980		X
9.	Navy: 1983 & 1987		X
10.	Army: 1977 & 1980		X
11.	Army: 1983 & 1987		X
12.	Marines: 1977 & 1980	X	
13.	Marines: 1983 & 1987		X
14.	Air Force: 1977 & 1980		X
15.	Air Force: 1983 & 1987		X

Source: Derived from data provided by DMDC.

Table 39. Percent Change in O-4 Promotion Rate for Significant Variables (at 0.05), 1977

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	5.8	6.2	-	-	-	-	8.0	8.0	-	-
Ethnic	-8.1	NA	NA	NA	NA	NA	-10.6	-	-21.9	-11.1
Postgrad	13.1	11.8	36.2	33.4	-	-	-	-	-	21.3
Study	20.5	20.3	22.6	24.2	19.0	20.5	11.4	14.9	-	28.6
Academy	6.3	5.2	17.5	22.3	-	-	-	10.0	-	9.4
ROTC	-	-	-	-	-	-	-7.0	-	-	8.7
Married	22.3	22.2	22.1	22.6	-	24.3	21.4	19.1	14.1	23.6
Children	4.3	4.2	-	-	-	-	8.3	-	-	5.9
Priorsvc	-	-	-	-	-	-	-	-	-	-
Age	-	-	-	-	-	-	-	0.9	-	-
Tactical	4.3	4.9	-	-	-	-	11.6	-	-	-
Intel	-	7.6	-	-	-	-	-	-	-	-
Engmaint	-	-	-	-	-	-	9.0	-	-	-
Sciprof	-	-	-	-	-	-	-	-	-	-
Health	-	-	-	-	-	-	-	-	-	19.8
Supply	-	-	-	-	-	-	-	-	-	-
Navy	14.9	15.5	-	-	-	-	NA	NA	NA	NA
Marines	-	-	-18.5	-24.6	-	-	NA	NA	NA	NA
Airforce	-	-	-	-	-	-	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

Table 40. Percent Change in O-4 Promotion Rate for Significant Variables (at 0.05), 1980

Variable	DoD	White	Ethnic	Black	Hisp	Other	USN	USA	USMC	USAF
Female	8.4	9.3	-	-	-	-	8.9	-	-	15.7
Ethnic	-	NA	NA	NA	NA	NA	-7.6	-	-	-
Postgrad	22.6	25.0	-	-	-	-	-	-	-	-
Study	27.3	27.4	26.3	25.8	35.3	29.3	18.3	19.0	-	35.3
Academy	11.3	12.2	-	-	-	-	-	8.6	-	18.1
ROTC	4.4	4.8	-	-	-	-	-	-	-	11.8
Married	22.6	23.3	16.9	18.4	-	-	22.6	19.2	20.2	22.8
Children	-	-	-	-	-	-	5.2	-	-21.8	6.6
Priorsvc	-7.5	-7.0	-9.8	-	-	-21.0	-7.4	-	-	-7.8
Age	-0.7	-0.5	-1.6	-	-	-3.2	-1.6	-2.9	-	-0.6
Tactical	-	4.1	-	-	-	-	-	-7.9	-	7.1
Intel	-	-	-	-	-	-	20.4	-	-	-
Engmaint	-	-	-	-	-	-	-	-8.3	-	-
Sciprof	-	-	-	-	-	-	-	-	-	-
Health	10.1	10.8	-	-	-	-	-	-	-	17.3
Supply	-	-	-	-	-	-	-	-11.6	-	-
Navy	18.1	18.8	11.1	-	-	37.0	NA	NA	NA	NA
Marines	6.5	6.4	-	-	-	-	NA	NA	NA	NA
Airforce	-	-	-	-	-	-	NA	NA	NA	NA

Source: Derived from data provided by DMDC.

promotion for women across DoD has increased during the period of the drawdown--due mainly to a large increase in the effect of this variable in the Air Force. Conversely, the significance of minority status on promotion outcomes has dissipated in all the services except for Navy. Holding all other variables constant, minority status in the Navy is associated with a 7.6 percent reduction in the likelihood of promotion. This problem is discussed further in Section D below.

STUDY and MARRIED are still very significant determinants of promotion probability, yet PRIORSVC and AGE have also become significant across racial groups and services. This is further evidence of the scrutiny with which promotion boards must operate during a downsizing environment. Officers who are older and/or have prior service appear less likely to be promoted than younger officers who have generally gone straight from college into one of the officer training programs.

The log likelihood ratio tests (Table 38) indicate that, although there is a significant difference in the 1977 and 1980 models for the Navy, Army, Air Force and whites, there has been no significant change in the models for the Marine Corps and all of the minority groups. This implies that the adverse impact on O-4 promotion outcomes that has been associated with the drawdown is only applicable to the former group (i.e. the Navy, Army, Air Force, and whites). The promotability of minorities has not been significantly affected at the DoD level. It is only in the Navy that minorities have encountered lower promotion rates that cannot be explained by the model.

D. MINORITY O-4 PROMOTION IN THE NAVY

As mentioned earlier, the Navy O-4 promotion probability model indicates that, holding all other variables constant, minority status is associated with a reduction in promotion probability of about 7.6 percent. An examination of the service variable for Navy, across the different racial/ethnic restricted

models in Table 40, provides more insight into the nature of this problem.

It appears incongruous, at first, that the change in promotion probability for minorities in the Navy is -7.6 percent, while the corresponding value for serving in the Navy in the ethnic model is +11.1 percent. This is the result of having different reference groups for each variable coefficient. The -7.6 percent coefficient is comparing the likelihood of promotion of a minority officer in the Navy against the likelihood of promotion of a non-minority officer in the Navy. By contrast, the 11.1 percent coefficient is comparing the likelihood of promotion of a minority officer in the Navy against the likelihood of promotion of a minority officer in the Army. This is less than the net benefit that white officers receive from being in the service that promotes at the highest rate (see Table 25) of 18.8 percent. Therefore, minority officers are relatively worse off in the Navy than white officers in that they gain less from the Navy's overall higher promotion rates.

Looking more closely at the minority models, though, it can be seen that all of the benefit of faster promotion to O-4 for minority officers in the Navy is, in effect, being siphoned through the "other" ethnic group. These officers are 37.0 percent more likely to be promoted by serving in the Navy as opposed to the Army. Meanwhile, blacks and Hispanics are the only racial/ethnic groups that receive no statistically significant improvement in promotion rates in the Navy, compared with those who serve in the Army (given their endowments of education and other characteristics). This is defying the fact that, during the drawdown, the Army O-4 promotion rate of 64.9 percent is much lower than the Navy's rate of 76.7 percent (Table 25).

It could be argued that the failure to detect faster promotion for blacks and Hispanics in the Navy (compared with the Army) is due to model specification problems--namely, that, although postgraduate education is included in the models, GPA

and an indicator of undergraduate college quality are not. This can be particularly relevant when we are dealing with different population groups. However, if model specification problems of this nature are the cause, then they should also be apparent in one or more of the other services. After all, the Navy is neither the largest nor the smallest employer of minority officers (in either absolute or relative terms), and it has neither the lowest nor highest technical requirements for its officers, when compared with the Army, Air Force, and Marine Corps. Clearly, the promotion of black and Hispanic officers to O-4 in the Navy requires further examination.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This study presents information and analysis pertaining to the impact of the drawdown on the promotion of minority officers. There are essentially two levels to the data analysis. First, there is an examination of unadjusted representation, occupation, and promotion trends. Second, the effect of minority status on promotion outcomes is assessed in a multivariate model that controls for other factors that may influence the promotion process.

A number of conclusions arise from the analysis of the unadjusted trends. The drawdown in the officer strength of DoD has not been implemented evenly across the separate services or the ethnic/racial groups. The data show that, throughout the drawdown, the proportion of white officers has fallen, while the proportions of minority groups have risen (due mainly to increases in minority representation in both relative and absolute terms in the Navy and Marine Corps). Although minority officers are generally overrepresented in the junior ranks, minority representation at each paygrade has increased throughout the drawdown (when compared with their total officer representation).

The occupational distribution of minority officers was stable throughout the drawdown across DoD. Minority officers have tended to be overrepresented in the supply, administration, health, and engineer/maintenance occupations. (Supply and administration had the lowest O-4 promotion rates both before and during the drawdown.) However, when the size of the occupation groups is considered, tactical operations becomes the singularly most important area--employing approximately 30 percent of minority officers.

The average promotion time to O-3 converged to 51 months for all racial/ethnic groups during the drawdown. This was not

evident at the O-4 level, however, where white officers continued to be promoted in quicker time than the minority officers. There were also differences in the promotion rates of the different racial/ethnic groups. Blacks have persistently experienced lower promotion rates to O-3. Although O-4 rates became a lot more uniform among whites, blacks, and Hispanics, the promotion rate of others appeared to deteriorate during the drawdown period.

A number of conclusions can also be drawn from the analysis regarding the effect of minority status on promotion outcomes. Because most of the determinants of promotion can be held constant in the promotion models, the effect of variables such as minority status can be isolated. The promotion rates of minorities and women to O-3 and O-4 have generally improved during the drawdown across DoD.

The determinants of promotion probabilities across DoD have undergone significant change throughout the drawdown period. This can be attributed to the more competitive promotion environment that the drawdown has created. Specifically, the performance and stability measures have become the most influential variables in determining the likelihood of promotion to O-3 and O-4. At the O-4 level, PRIORSVC and AGE have also become significant--providing further evidence of the competitive environment. Commissioning source and occupation variables have become less important.

At the DoD level, the drawdown period has been associated with an increased likelihood of promotion to O-4 for women, as well as the disappearance of the reduced likelihood of promotion for minority officers that existed in the 1977 cohort. The data suggest that minority status, per se, is no longer a factor in promotion outcomes; and, further, that the promotion of minority officers, in general, has not been adversely affected during the drawdown. In the case of the Navy, the reduced likelihood of promotion to O-4 associated with being a minority officer has decreased from 10.6 percent to 7.6 percent. (This is still a modest improvement.) However, if the different racial/ethnic

groups are examined, it can be argued that the 37 percent increase in promotion probability associated with the other racial/ethnic group masks a significant decline in promotion performance for blacks and Hispanics in the Navy.

B. RECOMMENDATIONS

This thesis represents one of the first attempts to determine the possible effects of the drawdown on the promotion of minority officers. As such, it should only be considered a starting point--there are a number of issues that require further attention. Although this study has reached the general conclusion that the promotion outcomes for minorities have actually benefited in relative terms during the drawdown, a conflicting trend was identified for black and Hispanic Naval officers. Separate research should seek to explain the causes of this trend in the Navy.

The present study could also be enhanced by overcoming some of the data limitations that existed in the DMDC data files. Specifically, undergraduate GPA, an indicator of college quality, and scores from performance evaluations should be included in any further research, if possible. This would avoid the doubt concerning how effective the proxy variables in this study are in representing the missing variables.

Any future research could also re-examine the O-4 promotion outcomes farther into the drawdown, to see if the trends identified in this thesis are reflected in the developments of the later drawdown years. It would also be useful to analyze officer groups that have entered the military during the drawdown. A comparison of the new officers' entry characteristics (such as education quality and SAT scores) could then be made. The effect of the drawdown on the attractiveness of the military as a career option (and the quality of those who are making the decision to join) could then be assessed. If any changes of this nature are associated with particular racial/ethnic groups, then these would have repercussions on

future promotion outcomes in DoD. Finally, it would be advantageous for further research to incorporate an analysis of O-5 promotions. Increasing numbers of minority officers have been getting promoted to O-4. It is appropriate to continue moving the focus of analysis up the promotion ladder. This would help to prevent any problem areas or bottlenecks from being undetected for too long, so that the military's minority officer representation goals can be reached at all levels as expeditiously as possible.

APPENDIX A. DoD O-3 PROMOTION TIME MODEL, 1983, 1987

Variable	1983		1987	
	Estimate	T value	Estimate	T value
Female	0.51	3.55	0.21	1.10
Ethnic	0.13	0.89	-0.36	-1.96
Postgrad	-3.71	-11.34	-2.23	-4.74
Study	-0.17	-1.44	-0.98	-4.12
Academy	-1.22	-9.20	0.54	3.10
ROTC	-1.04	-10.15	-0.90	-5.78
Married	0.00	0.02	0.02	0.19
Children	-0.16	-1.09	-0.42	-2.93
Priorsvc	3.49	31.97	2.72	17.69
Age	0.11	5.90	0.08	2.74
Tactical	1.07	5.92	1.35	5.16
Intel	-0.04	-0.15	0.54	1.54
Engmaint	-0.25	-1.29	0.34	1.20
Sciprof	-3.31	-10.45	0.26	0.55
Health	-1.66	-6.72	-1.98	-5.74
Supply	0.50	1.90	0.39	1.12
Navy	1.27	10.24	-10.00	-49.59
Marines	10.61	53.26	-4.07	-15.53
Airforce	0.02	0.18	-10.45	-54.39
F value	353.79		266.01	
R-square	0.31		0.35	
N	15185		9467	

Source: Derived from data provided by DMDC.

APPENDIX B. DoD O-4 PROMOTION TIME MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	T value	Estimate	T value
Female	1.23	3.12	-0.25	-0.83
Ethnic	0.25	0.80	1.03	3.56
Postgrad	-3.94	-7.34	-0.22	-0.37
Study	-0.39	-1.87	0.01	0.07
Academy	-0.89	-2.69	-1.01	-3.46
ROTC	1.23	4.53	-0.65	-2.79
Married	0.11	0.34	0.17	0.58
Children	0.03	0.13	-0.31	-1.34
Priorsvc	-0.90	-3.32	-1.20	-5.04
Age	0.12	2.45	-0.00	-0.01
Tactical	-1.42	-4.39	-1.50	-4.76
Intel	-2.10	-3.85	-1.76	-3.84
Engmaint	-2.27	-6.15	-0.59	-1.75
Sciprof	-0.37	-0.52	-1.48	-2.34
Health	-5.48	-9.84	-9.18	-18.54
Supply	0.24	0.45	0.14	0.28
Navy	-26.64	-98.10	-22.25	-83.73
Marines	3.35	7.67	2.24	4.85
Airforce	-10.23	-42.47	-0.54	-2.21
F value	777.98		631.45	
R-square	0.69		0.62	
N	6616		7250	

Source: Derived from data provided by DMDC.

APPENDIX C. DoD O-3 PROMOTION PROBABILITY MODEL, 1983, 1987

Variable	1983		1987	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.09	1.43	0.08	0.62
Ethnic	-0.12	2.14	0.04	0.16
Postgrad	0.18	1.19	0.47	2.13
Study	91.00	0.00	3.07	36.24
Academy	1.96	191.94	0.50	21.73
ROTC	-0.09	2.85	0.06	0.49
Married	91.31	0.00	2.00	484.54
Children	90.61	0.00	1.10	46.43
Priorsvc	-0.19	8.74	0.02	0.06
Age	-0.03	8.30	0.01	0.12
Tactical	0.83	78.57	0.68	19.68
Intel	0.31	5.51	0.31	2.63
Engmaint	-0.10	1.14	-0.02	0.02
Sciprof	0.40	4.23	-0.04	0.02
Health	0.29	4.47	-0.31	2.68
Supply	0.11	0.83	-0.19	1.00
Navy	0.41	35.36	1.64	252.41
Marines	-0.20	4.35	0.49	17.20
Airforce	1.19	319.17	1.78	329.46
Concordant	37.1%		83.3%	
N	17551		10869	

Source: Derived from data provided by DMDC.

APPENDIX D. DoD O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.32	8.71	0.39	24.80
Ethnic	-0.45	31.21	-0.01	0.01
Postgrad	0.72	20.74	1.05	46.08
Study	1.13	273.73	1.27	530.05
Academy	0.35	11.55	0.52	41.67
ROTC	0.09	1.40	0.20	12.05
Married	1.23	263.13	1.05	243.53
Children	0.24	11.76	0.08	1.61
Priorsvc	-0.13	3.11	-0.35	32.87
Age	-0.02	1.74	-0.03	9.88
Tactical	0.24	6.82	0.14	3.45
Intel	0.29	3.34	0.14	1.68
Engmaint	0.19	3.42	-0.01	0.02
Sciprof	0.04	0.03	-0.26	2.83
Health	0.22	1.82	0.47	12.20
Supply	0.14	0.95	-0.13	1.19
Navy	0.82	97.40	0.84	135.88
Marines	-0.19	3.14	0.30	7.44
Airforce	-0.01	0.02	-0.04	0.51
Concordant	72.3%		71.5%	
N	8694		10599	

Source: Derived from data provided by DMDC.

APPENDIX E. WHITE O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.35	8.50	0.43	25.44
Postgrad	0.67	17.00	1.16	46.29
Study	1.16	242.65	1.27	471.49
Academy	0.30	7.63	0.57	44.01
ROTC	0.08	0.93	0.22	12.99
Married	1.27	241.74	1.08	229.28
Children	0.24	10.40	0.08	1.42
Priorsvc	-0.16	3.66	-0.33	26.06
Age	-0.03	3.49	-0.02	5.63
Tactical	0.28	7.68	0.19	5.15
Intel	0.43	6.23	0.21	2.99
Engmaint	0.22	3.64	0.01	0.01
Sciprof	0.13	0.32	-0.24	2.15
Health	0.18	1.09	0.50	11.94
Supply	0.18	1.14	-0.17	1.74
Navy	0.88	100.78	0.87	132.28
Marines	-0.12	1.17	0.30	6.71
Airforce	0.05	0.55	-0.04	0.52
Concordant	72.2%		71.9%	
N	7699		9427	

Source: Derived from data provided by DMDC.

APPENDIX F. ETHNIC O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.19	0.55	0.11	0.32
Postgrad	1.63	5.71	0.56	2.30
Study	1.02	33.99	1.18	55.22
Academy	0.79	6.42	0.17	0.45
ROTC	0.22	1.13	0.05	0.08
Married	0.99	23.37	0.76	15.25
Children	0.20	1.18	0.07	0.17
Priorsvc	0.07	0.12	-0.44	5.82
Age	0.04	1.23	-0.07	6.62
Tactical	0.06	0.10	-0.13	0.43
Intel	-0.38	0.94	-0.25	0.64
Engmaint	0.12	0.26	-0.06	0.09
Sciprof	-0.50	0.86	-0.26	0.25
Health	1.03	3.22	0.26	0.55
Supply	0.02	0.01	0.04	0.02
Navy	0.41	2.52	0.50	4.35
Marines	-0.83	4.51	0.51	1.09
Airforce	-0.30	3.05	-0.02	0.01
Concordant	69.4%		68.9%	
N	995		1172	

Source: Derived from data provided by DMDC.

APPENDIX G. BLACK O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.17	0.33	0.01	0.01
Postgrad	1.44	3.98	0.80	2.97
Study	1.04	24.84	1.18	32.75
Academy	0.96	5.87	0.67	3.20
ROTC	0.32	1.60	0.13	0.34
Married	0.97	15.55	0.84	12.06
Children	0.13	0.34	0.02	0.01
Priorsvc	0.18	0.47	-0.30	1.80
Age	0.07	2.07	-0.05	2.03
Tactical	-0.01	0.01	-0.29	1.37
Intel	-0.12	0.04	-0.26	0.37
Engmaint	0.06	0.04	-0.08	0.10
Sciprof	-0.34	0.34	-0.49	0.79
Health	0.92	1.76	0.22	0.19
Supply	0.06	0.03	0.05	0.02
Navy	0.37	1.37	0.12	0.14
Marines	-1.06	4.52	0.03	0.01
Airforce	-0.44	4.69	-0.28	1.57
Concordant	69.4%		68.9%	
N	660		734	

Source: Derived from data provided by DMDC.

APPENDIX H. HISPANIC O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	1.00	0.94	0.94	0.91
Postgrad	89.72	0.00	0.50	0.14
Study	1.07	3.97	1.61	9.63
Academy	0.31	0.14	0.04	0.01
ROTC	0.56	0.89	0.34	0.18
Married	0.98	2.60	0.83	1.18
Children	0.57	1.23	0.29	0.26
Priorsvc	0.90	1.75	0.08	0.01
Age	0.14	1.04	0.05	0.28
Tactical	0.69	1.12	0.18	0.05
Intel	-0.27	0.09	-1.11	0.74
Engmaint	0.86	1.31	-0.50	0.42
Sciprof	-1.11	0.44	0.00	0.00
Health	90.85	0.00	0.17	0.02
Supply	1.37	1.12	-1.10	1.28
Navy	0.40	0.34	-0.34	0.09
Marines	-0.86	0.87	-0.21	0.01
Airforce	-0.26	0.27	-0.68	0.42
Concordant	69.7%		75.0%	
N	169		126	

Source: Derived from data provided by DMDC.

APPENDIX I. OTHER O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.20	0.07	0.10	0.05
Postgrad	89.51	0.00	-0.01	0.00
Study	1.00	4.62	1.25	16.18
Academy	0.42	0.28	-0.30	0.42
ROTC	-0.37	0.36	-0.16	0.21
Married	1.18	4.30	0.44	1.11
Children	0.21	0.20	0.25	0.47
Priorsvc	-0.96	3.32	-0.90	5.02
Age	-0.12	1.26	0.14	6.39
Tactical	-0.50	0.53	0.55	1.54
Intel	-1.53	2.33	0.55	0.86
Engmaint	-0.52	0.47	0.26	0.29
Sciprof	0.00	0.00	89.44	0.00
Health	-0.30	0.04	0.92	2.15
Supply	-0.75	0.47	0.17	0.06
Navy	0.13	0.04	1.58	9.89
Marines	-1.01	0.70	1.61	1.84
Airforce	0.08	0.03	0.69	3.44
Concordant	69.7%		72.1%	
N	166		312	

Source: Derived from data provided by DMDC.

APPENDIX J. USN O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.54	4.75	0.50	6.52
Ethnic	-0.72	9.84	-0.43	4.41
Postgrad	0.29	0.20	0.48	0.94
Study	0.78	18.17	1.03	45.34
Academy	0.24	1.27	0.22	1.50
ROTC	-0.48	6.15	-0.27	2.37
Married	1.46	81.43	1.27	74.39
Children	0.56	11.13	0.29	4.22
Priorsvc	-0.25	1.66	-0.42	8.07
Age	-0.01	0.07	-0.09	14.14
Tactical	0.79	13.08	0.35	2.69
Intel	0.39	1.05	1.14	10.31
Engmaint	0.61	6.49	0.17	0.54
Sciprof	0.15	0.15	-0.38	1.14
Health	0.03	0.01	0.08	0.07
Supply	0.59	2.18	0.11	0.10
Concordant	75.1%		71.8%	
N	2176		2246	

Source: Derived from data provided by DMDC.

APPENDIX K. USA O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.40	4.80	-0.17	1.63
Ethnic	-0.23	3.77	0.02	0.03
Postgrad	0.42	2.98	0.42	1.13
Study	0.75	44.70	0.83	61.35
Academy	0.48	7.30	0.38	7.70
ROTC	0.07	0.33	-0.04	0.20
Married	0.96	52.56	0.84	48.16
Children	0.03	0.09	-0.12	1.30
Priorsvc	-0.19	2.64	-0.10	0.41
Age	-0.05	4.10	-0.13	42.67
Tactical	0.14	1.06	-0.35	5.58
Intel	0.26	1.36	-0.18	0.73
Engmaint	0.03	0.03	-0.36	4.70
Sciprof	0.67	0.69	1.29	1.43
Health	0.13	0.11	0.46	3.70
Supply	0.07	0.11	-0.51	6.08
Concordant	64.5%		66.3%	
N	2794		3022	

Source: Derived from data provided by DMDC.

APPENDIX L. USMC O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	-0.31	0.28	-0.39	0.36
Ethnic	-0.98	7.05	0.10	0.04
Postgrad	-1.39	1.23	0.00	0.00
Study	0.39	2.26	0.44	2.13
Academy	-0.19	0.25	0.33	1.06
ROTC	0.09	0.19	0.10	0.19
Married	0.63	5.38	0.91	7.61
Children	0.13	0.34	-0.98	11.53
Priorsvc	0.21	0.94	0.01	0.01
Age	0.05	0.95	0.01	0.04
Tactical	-0.05	0.01	0.37	0.41
Intel	0.48	0.42	-1.06	1.39
Engmaint	0.77	1.78	0.04	0.01
Sciprof	89.57	0.00	-88.98	0.00
Health	0.00	0.00	0.00	0.00
Supply	0.49	0.86	-0.85	1.79
Concordant	62.1%		59.1%	
N	591		504	

Source: Derived from data provided by DMDC.

APPENDIX M. USAF O-4 PROMOTION PROBABILITY MODEL, 1977, 1980

Variable	1977		1980	
	Estimate	Wald Chi-Sq	Estimate	Wald Chi-Sq
Female	0.14	0.59	0.71	36.86
Ethnic	-0.63	21.09	0.05	0.19
Postgrad	1.20	25.09	1.32	53.32
Study	1.62	245.45	1.59	468.13
Academy	0.53	6.79	0.82	34.81
ROTC	0.49	8.42	0.53	26.25
Married	1.34	105.56	1.03	97.40
Children	0.33	7.63	0.30	10.05
Priorsvc	-0.10	0.39	-0.34	14.08
Age	0.01	0.01	0.03	3.93
Tactical	0.06	0.12	0.32	8.83
Intel	0.09	0.08	0.04	0.05
Engmaint	0.11	0.37	0.04	0.16
Sciprof	-0.05	0.03	-0.17	0.74
Health	1.12	12.81	0.78	14.74
Supply	-0.37	1.96	0.18	1.00
Concordant	77.0%		76.4%	
N	3133		4827	

Source: Derived from data provided by DMDC.

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